PA score Package
Airport Holding A
(TXD987990314)
Houston, TX

TARGET SHEET

SITE NAME: AIRPORT HOLDING A

CERCLIS I.D.: TXD987990314

TITLE OF DOC.: FILE - 3 1/2 DISKETTE - PA SCORE AIRPORT HOLDING A - HOUSTON, TX - EPA ID NO. TXD987990314 NO. 04603-022-028 - NO FILE FOUND OR COULD BE PULL OFF - 01/31/1996

DATE OF DOC.: UNKNOWN

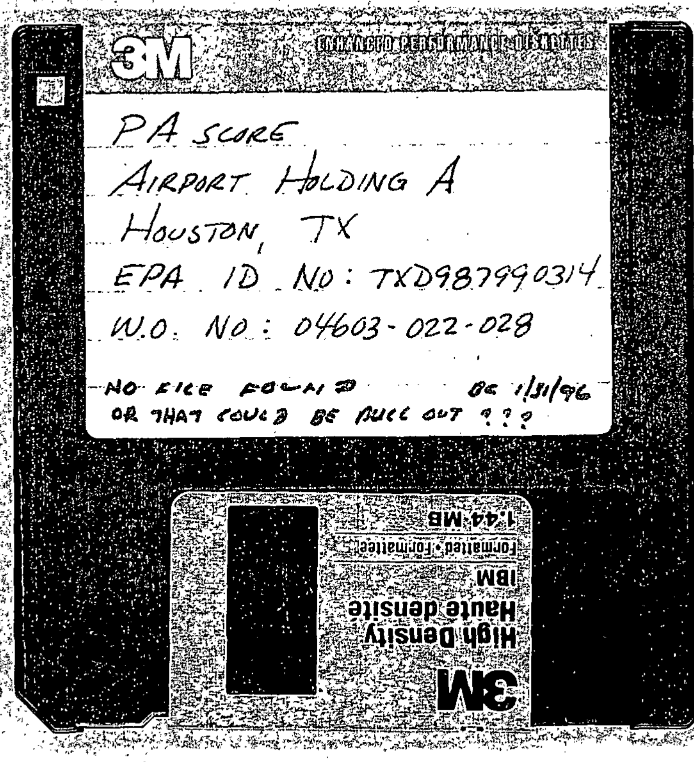
NO. OF PGS. THIS TARGET SHEET REPLACES: 1

SDMS #: 90073450 KEYWORD:

CONFIDENTIAL ?		MISSING PAGES ?	X
ALTERN. MEDIA ?		CROSS REFERENCE ?	

LAB DOCUMENT ?		LAB NAME:	
ASC./BOX #:			
CASE #:		SDG #:	

COMMENTS : THIS FILE IS OF AN UNKNOWN OR UNSUPPORTED FORMAT AND CANNOT BE OPENED AT THIS TIME.



From

To

AIRPORT HOLDING A
(TXD987990314)

DISK MAILER
Handle With Care
FIRST CLASS MAIL

OMB Approval Number: 2050-0095
Approved for Use Through: 4/95

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION
	State: TX / CERCLIS Number: TXD987990314
	CERCLIS Discovery Date: 3-26-90

1. General Site Information

Name: Airport Holding A			Street Address: 2510 Farrel Road			
City: Houston	State: TX		Zip Code: 77073	County: Harris	Co. Code:	Cong. Dist:
Latitude: 29 59' 20.3"	Longitude: 95 22' 34.1"	Approx. Area of Site: 3 acres		Status of Site: Active		

2. Owner/Operator Information

Owner			Operator		
Owner: Chris Davis			Operator: Chris Davis		
Street Address: 2510 Farrel Road			Street Address: 2510 Farrel Road		
City: Houston			City: Houston		
State: TX	Zip Code: 77073	Telephone: 713-443-7665	State: TX	Zip Code: 77073	Telephone: 713-443-7665
Type of Ownership: Private			How Initially Identified: Other EPA Site Identification Form		

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION
	State: TX / CERCLIS Number: TXD987990314
	CERCLIS Discovery Date: 3-26-90

3. Site Evaluator Information

Name of Evaluator:	Agency/Organization:	Date Prepared:
Karen A. Dorsey	Roy F. Weston, Inc.	29 Dec 95

Street Address:	City:	State:
5599 San Felipe Suite 700	Houston	TX

Name of EPA or State Agency Contact:	Telephone:
Ed Sierra	(214) 665-6740

Street Address:	City:	State:
1445 Ross Avenue, Suite 1200	Dallas	TX

4. Site Disposition (for EPA use only)

Emergency Response/Removal Assessment Recommendation: No	CERCLIS Recommendation: NFRAP	Signature:
		Name:
Date:	Date:	Position:

POTENTIAL HAZARDOUS

WASTE SITE

PRELIMINARY ASSESSMENT FORM

IDENTIFICATION

State:	CERCLIS Number:
TX	TXD987990314

CERCLIS Discovery Date:
3-26-90

5. General Site Characteristics

Predominant Land Uses Within 1 Mile of Site:
- Industrial
- Commercial
- Residential
- Forest/Fields

Site Setting:
Suburban

Years of Operation:
Beginning Year: 0

Ending Year: 0

X Unknown

Type of Site Operations:
Other:
Construction of pallets

Waste Generated:
Onsite

Waste Deposition Authorized By: Unknown

Waste Accessible to the Public
No

Distance to Nearest Dwelling, School, or Workplace:
3000 Feet

6. Waste Characteristics Information

Source Type	Quantity	Tier
Contaminated soil	2.00e+04 sq ft	A

General Types of Waste:
Other:
Unknown

Physical State of Waste as Deposited

Tier Legend
C = Constituent W = Wastestream
V = Volume A = Area

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION
	State: TX
	CERCLIS Number: TXD987990314
	CERCLIS Discovery Date: 3-26-90

7. Ground Water Pathway

Is Ground Water Used for Drinking Water Within 4 Miles:
YES

Type of Ground Water Wells Within 4 Miles:
Municipal
Private

Depth to Shallowest Aquifer:
50 Feet

Karst Terrain/Aquifer Present:
No

Is There a Suspected Release to Ground Water:
No

Have Primary Target Drinking Water Wells Been Identified: No

Nearest Designated Wellhead Protection Area:
>0 - 4 Miles

List Secondary Target Population Served by Ground Water Withdrawn From:

0 - 1/4 Mile	0
>1/4 - 1/2 Mile	0
>1/2 - 1 Mile	0
>1 - 2 Miles	100
>2 - 3 Miles	400
>3 - 4 Miles	1009
Total	1509

POTENTIAL HAZARDOUS

WASTE SITE

PRELIMINARY ASSESSMENT FORM

IDENTIFICATION

State:	CERCLIS Number:
TX	TXD987990314

CERCLIS Discovery Date:
3-26-90

8. Surface Water Pathway — Part 1 of 4

Type of Surface Water Draining Site and 15 Miles Downstream:
Stream
Other:
Intermitent Stream

Shortest Overland Distance From Any Source to Surface Water:
47520 Feet
9.0 Miles

Is there a Suspected Release to Surface Water: No

Site is Located in:
> 500 yr floodplain

8. Surface Water Pathway — Part 2 of 4

Drinking Water Intakes Along the Surface Water Migration Path: NO

Have Primary Target Drinking Water Intakes Been Identified: No

Secondary Target Drinking Water Intakes:

Name	Water Body/Flow(cfs)	Population Served
None	minimal stream/ <10	0
	Total Within 15 Miles:	0

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: TX	CERCLIS Number: TXD987990314
	CERCLIS Discovery Date: 3-26-90	

8. Surface Water Pathway — Part 3 of 4

Fisheries Located Along the Surface Water Migration Path: No

Have Primary Target Fisheries Been Identified: No

Secondary Target Fisheries:
None

8. Surface Water Pathway — Part 4 of 4

Wetlands Located Along the Surface Water Migration Path? (y/n) No

Have Primary Target Wetlands Been Identified? (y/n) No

Secondary Target Wetlands:
None

Other Sensitive Environments Along the Surface Water Migration Path: No

Have Primary Target Sensitive Environments Been Identified: No

Secondary Target Sensitive Environments:
None

POTENTIAL HAZARDOUS

WASTE SITE

PRELIMINARY ASSESSMENT FORM

IDENTIFICATION

State:	CERCLIS Number:
TX	TXD987990314

CERCLIS Discovery Date: 3-26-90

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination: No

Number of Workers Onsite: 1 - 100

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination: Yes

Terrestrial Sensitive Environments:

Critical habitat for Federally designated endang/threat species

10. Air Pathway

Total Population on or Within:

Onsite	0
0 - 1/4 Mile	0
>1/4 - 1/2 Mile	1534
>1/2 - 1 Mile	0
>1 - 2 Miles	19
>2 - 3 Miles	11243
>3 - 4 Miles	24431
Total	37227

Is There a Suspected Release to Air: No

Wetlands Located Within 4 Miles of the Site: No

Other Sensitive Environments Located Within 4 Miles of the Site: Yes

Sensitive Environments Within 1/2 Mile of the Site:

Distance	Sensitive Environment Type/Wetlands Area(acres)
Onsite	Habitat for Federally designated endangered/threatened species

OMB Approval Number: 2050-0095
Approved for Use Through: 4/95

PA Scoresheets

Site Name: Airport Holding A
CERCLIS ID No.: TXD987990314
Street Address: 2510 Farrel Road
City/State/Zip: Houston, TX 77073

Investigator: Karen A. Dorsey
Agency/Organization: Roy F. Weston, Inc.
Street Address: 5599 San Felipe Suite 700
City/State: Houston, TX

Date: 29 Dec 95

WASTE CHARACTERISTICS

Waste Characteristics (WC) Calculations:

				WQ value	maximum
1 Stained Soil	Contaminated soil	Ref: 3, 5			
Area	2.00E+04 sq ft			5.88E-01	5.88E-01

The EPA Potential Hazardous Waste Site Identification Form and the WESTON aerial photograph review indicate an area of discoloration. For PAscoring purposes, this area is assumed to consist of stained soils. This area covers approximately 20,000 square feet.
Ref: 3, 5, 6

** Only First WC Page Is Printed ** | Waste Characteristics Score: WC = 18

Ground Water Pathway Criteria List
Suspected Release

Are sources poorly contained? (y/n/u)	Y
Is the source a type likely to contribute to ground water contamination (e.g., wet lagoon)? (y/n/u)	N
Is waste quantity particularly large? (y/n/u)	Y
Is precipitation heavy? (y/n/u)	Y
Is the infiltration rate high? (y/n/u)	N
Is the site located in an area of karst terrain? (y/n)	N
Is the subsurface highly permeable or conductive? (y/n/u)	N
Is drinking water drawn from a shallow aquifer? (y/n/u)	Y
Are suspected contaminants highly mobile in ground water? (y/n/u)	N
Does analytical or circumstantial evidence suggest ground water contamination? (y/n/u)	N

Other criteria? (y/n) N

SUSPECTED RELEASE? (y/n) N

Summarize the rationale for Suspected Release:

Based on available background information and the results of WESTON's site reconaissance, one potential source of hazardous substances consisting of contaminated soils has been identified. A release of hazardous substances into groundwater has not been documented. The near surface soils have low permeabilities, and no wells are located within a 1-mile radius of the site. Therefore, a release of hazardous substances into the groundwater is not suspected.

Ref: 3, 5, 6, 9, 13

Ground Water Pathway Criteria List
Primary Targets

Is any drinking water well nearby? (y/n/u)

Has any nearby drinking water well been closed? (y/n/u)

Has any nearby drinking water well user reported foul-testing or foul-smelling water? (y/n/u)

Does any nearby well have a large drawdown/high production rate? (y/n/u)

Is any drinking water well located between the site and other wells that are suspected to be exposed to a hazardous substance? (y/n/u)

Does analytical or circumstantial evidence suggest contamination at a drinking water well? (y/n/u)

Does any drinking water well warrant sampling? (y/n/u)

Other criteria? (y/n)

PRIMARY TARGET(S) IDENTIFIED? (y/n)

Summarize the rationale for Primary Targets:

GROUND WATER PATHWAY SCORESHEETS

Pathway Characteristics		Ref.
Do you suspect a release? (y/n)	No	
Is the site located in karst terrain? (y/n)	No	6
Depth to aquifer (feet):	50	7
Distance to the nearest drinking water well (feet):	5300	12

LIKELIHOOD OF RELEASE	Suspected Release	No Suspected Release	References
1. SUSPECTED RELEASE	0		
2. NO SUSPECTED RELEASE		500	
LR =	0	500	

Targets

TARGETS	Suspected Release	No Suspected Release	References
3. PRIMARY TARGET POPULATION 0 person(s)	0		
4. SECONDARY TARGET POPULATION Are any wells part of a blended system? (y/n) Y	0	21	
5. NEAREST WELL	0	5	
6. WELLHEAD PROTECTION AREA >0 - 4 Miles	0	5	
7. RESOURCES	0	5	
T =	0	36	

WASTE CHARACTERISTICS

WC =	0	18

GROUND WATER PATHWAY SCORE: 4

Ground Water Target Populations

Primary Target Population Drinking Water Well ID	Dist. (miles)	Population Served	Reference	Value
None				
*** Note : Maximum of 5 Wells Are Printed ***			Total	

Secondary Target Population Distance Categories	Population Served	Reference	Value
0 to 1/4 mile	0	13	0
Greater than 1/4 to 1/2 mile	0	13	0
Greater than 1/2 to 1 mile	0	13	0
Greater than 1 to 2 miles	100	13	1
Greater than 2 to 3 miles	400	13	7
Greater than 3 to 4 miles	1009	13	13
		Total	21

Apportionment Documentation for a Blended System

There are no wells located within a 1-mile radius of the site There is one public supply well located between 1 and 2 miles of the site. A population of 100 people has been assumed for each public supply well in the area; therefore, a population of 100 has been assumed for the 1 to 2 mile distance category. There are four public supply wells between 2 and 3 miles of the site. Therefore, a population of 400 has been assumed for the 2 to 3 mile distance category. There are 10 public supply wells and 3 domestic wells within 3 to 4 miles of the site. It is assumed that each domestic well serves one household and that 3 people reside in each household. Therefore, a population of 1,009 has been assumed for the 3 to 4 mile distance category.

It should be noted that an assumed population of 2,900 people per public supply well results in a PAscore of 21 for this site, and an assumed population of 3,000 people per public supply well results in a PAscore of 37 for this site.

Ref: 13

Surface Water Pathway Criteria List
Suspected Release

Is surface water nearby? (y/n/u)	N
Is waste quantity particularly large? (y/n/u)	Y
Is the drainage area large? (y/n/u)	N
Is rainfall heavy? (y/n/u)	Y
Is the infiltration rate low? (y/n/u)	Y
Are sources poorly contained or prone to runoff or flooding? (y/n/u)	N
Is a runoff route well defined(e.g.ditch/channel to surf.water)? (y/n/u)	N
Is vegetation stressed along the probable runoff path? (y/n/u)	N
Are sediments or water unnaturally discolored? (y/n/u)	N
Is wildlife unnaturally absent? (y/n/u)	N
Has deposition of waste into surface water been observed? (y/n/u)	N
Is ground water discharge to surface water likely? (y/n/u)	N
Does analytical/circumstantial evidence suggest S.W. contam? (y/n/u)	N
Other criteria? (y/n) N	
SUSPECTED RELEASE? (y/n)	N

Summarize the rationale for Suspected Release:

A release of hazardous substances to the surface water pathway is not of concern due to the absence of a defined surface water pathway within 9 miles of the site.

Ref: 2, 15

Surface Water Pathway Criteria List
Primary Targets

Is any target nearby? (y/n/u) If yes: Y
- N Drinking water intake
- Y Fishery
- Y Sensitive environment

Has any intake, fishery, or recreational area been closed? (y/n/u) N

Does analytical or circumstantial evidence suggest surface water contamination at or downstream of a target? (y/n/u) N

Does any target warrant sampling? (y/n/u) If yes: N
- N Drinking water intake
- N Fishery
- N Sensitive environment

Other criteria? (y/n) N

PRIMARY INTAKE(S) IDENTIFIED? (y/n) N

Summarize the rationale for Primary Intakes:

No drinking water intakes are known to be present in the site area.

Ref: 13

continued -------

continued --------

Other criteria? (y/n) N

PRIMARY FISHERY(IES) IDENTIFIED? (y/n) N

Summarize the rationale for Primary Fisheries:

There are no fisheries identified within the surface water pathway. The nearest perennial-flowing surface water body is located 9 miles from the site.

Ref: 19

Other criteria? (y/n) N

PRIMARY SENSITIVE ENVIRONMENT(S) IDENTIFIED? (y/n) N

Summarize the rationale for Primary Sensitive Environments:

The existence of wetlands near the site is unknown because Federal wetlands inventory maps are unavailable.

SURFACE WATER PATHWAY SCORESHEETS

Pathway Characteristics		Ref.
Do you suspect a release? (y/n)	No	
Distance to surface water (feet):	47520	2,15
Flood frequency (years):	>500	16
What is the downstream distance (miles) to:		
a. the nearest drinking water intake?	9.0	13
b. the nearest fishery?	9.0	19
c. the nearest sensitive environment?	9.0	2,15

LIKELIHOOD OF RELEASE	Suspected Release	No Suspected Release	References
1. SUSPECTED RELEASE	0		
2. NO SUSPECTED RELEASE		100	
LR =	0	100	

Drinking Water Threat Targets

TARGETS	Suspected Release	No Suspected Release	References
3. Determine the water body type, flow (if applicable), and number of people served by each drinking water intake.			
4. PRIMARY TARGET POPULATION 0 person(s)	0		
5. SECONDARY TARGET POPULATION Are any intakes part of a blended system? (y/n): N	0	0	
6. NEAREST INTAKE	0	20	
7. RESOURCES	0	5	
T =	0	25	

Drinking Water Threat Target Populations

Intake Name	Primary (y/n)	Water Body Type/Flow	Population Served	Ref.	Value
1 None	N		0		0

Total Primary Target Population Value	0
Total Secondary Target Population Value	0

*** Note : Maximum of 6 Intakes Are Printed ***

Apportionment Documentation for a Blended System

Human Food Chain Threat Targets

TARGETS	Suspected Release	No Suspected Release	References
8. Determine the water body type and flow for each fishery within the target limit.			
9. PRIMARY FISHERIES	0		
10. SECONDARY FISHERIES	0	0	
T =	0	0	

Human Food Chain Threat Targets

Fishery Name	Primary (y/n)	Water Body Type/Flow	Ref.	Value
None				

Total Primary Fisheries Value	0
Total Secondary Fisheries Value	0

*** Note : Maximum of 6 Fisheries Are Printed ***

Environmental Threat Targets

TARGETS	Suspected Release	No Suspected Release	References
11. Determine the water body type and flow (if applicable) for each sensitive environment.			
12. PRIMARY SENSITIVE ENVIRONMENTS	0		
13. SECONDARY SENSITIVE ENVIRONS.	0	0	
T =	0	0	

Environmental Threat Targets

Sensitive Environment Name	Primary (y/n)	Water Body Type/Flow	Ref.	Value
None				

Total Primary Sensitive Environments Value	0
Total Secondary Sensitive Environments Value	0

*** Note: Maximum of 6 Sensitive Environments Are Printed ***

Surface Water Pathway Threat Scores

Threat	Likelihood of Release(LR) Score	Targets(T) Score	Pathway Waste Characteristics (WC) Score	Threat Score LR x T x WC / 82,500
Drinking Water	100	25	18	1
Human Food Chain	100	0	18	0
Environmental	100	0	18	0

SURFACE WATER PATHWAY SCORE:	1

Soil Exposure Pathway Criteria List
Resident Population

Is any residence, school, or daycare facility on or within 200 feet of an area of suspected contamination? (y/n/u)	N
Is any residence, school, or daycare facility located on adjacent land previously owned or leased by the site owner/operator? (y/n/u)	N
Is there a migration route that might spread hazardous substances near residences, schools, or daycare facilities? (y/n/u)	N
Have onsite or adjacent residents or students reported adverse health effects, exclusive of apparent drinking water or air contamination problems? (y/n/u)	N
Does any neighboring property warrant sampling? (y/n/u)	N

Other criteria? (y/n) N

RESIDENT POPULATION IDENTIFIED? (y/n) N

Summarize the rationale for Resident Population:

A resident population is associated with the site because approximately 12 individuals work on the site property.

Ref: 4

SOIL EXPOSURE PATHWAY SCORESHEETS

Pathway Characteristics		Ref.
Do any people live on or within 200 ft of areas of suspected contamination? (y/n)	No	6
Do any people attend school or daycare on or within 200 ft of areas of suspected contamination? (y/n)	No	6
Is the facility active? (y/n):	Yes	6

LIKELIHOOD OF EXPOSURE	Suspected Contamination	References
1. SUSPECTED CONTAMINATION LE =	550	

Targets

2. RESIDENT POPULATION 0 resident(s) 0 school/daycare student(s)	0	4,5
3. RESIDENT INDIVIDUAL	0	
4. WORKERS 1 - 100	5	4
5. TERRES. SENSITIVE ENVIRONMENTS	0	
6. RESOURCES	5	
T =	10	

WASTE CHARACTERISTICS

WC = 18

RESIDENT POPULATION THREAT SCORE: 1

NEARBY POPULATION THREAT SCORE: 1

Population Within 1 Mile: 1 - 10,000

SOIL EXPOSURE PATHWAY SCORE: 2

Soil Exposure Pathway Terrestrial Sensitive Environments

Terrestrial Sensitive Environment Name	Reference	Value
1 None		
Total Terrestrial Sensitive Environments Value		

*** Note : Maximum of 7 Sensitive Environments Are Printed ***

Air Pathway Criteria List
Suspected Release

Are odors currently reported? (y/n/u)	N
Has release of a hazardous substance to the air been directly observed? (y/n/u)	N
Are there reports of adverse health effects (e.g., headaches, nausea, dizziness) potentially resulting from migration of hazardous substances through the air? (y/n/u)	N
Does analytical/circumstantial evidence suggest release to air? (y/n/u)	N
Other criteria? (y/n)	N
SUSPECTED RELEASE? (y/n)	N

Summarize the rationale for Suspected Release:

A release of hazardous substances to the air pathway does not appear to be of concern. A release of hazardous substances into the air pahtway has not been documented.

Ref: 4, 5

AIR PATHWAY SCORESHEETS

Pathway Characteristics		Ref.
Do you suspect a release? (y/n)	No	
Distance to the nearest individual (feet):	0	

LIKELIHOOD OF RELEASE	Suspected Release	No Suspected Release	References
1. SUSPECTED RELEASE	0		
2. NO SUSPECTED RELEASE		500	
LR =	0	500	

Targets

TARGETS	Suspected Release	No Suspected Release	References
3. PRIMARY TARGET POPULATION 0 person(s)	0		
4. SECONDARY TARGET POPULATION	0	15	
5. NEAREST INDIVIDUAL	0	2	
6. PRIMARY SENSITIVE ENVIRONS.	0		
7. SECONDARY SENSITIVE ENVIRONS.	0	0	
8. RESOURCES	0	5	
T =	0	22	

WASTE CHARACTERISTICS

WC =	0	18

AIR PATHWAY SCORE: 2

Air Pathway Secondary Target Populations

Distance Categories	Population	References	Value
Onsite	0	20	0
Greater than 0 to 1/4 mile	0	20	0
Greater than 1/4 to 1/2 mile	1534	20	9
Greater than 1/2 to 1 mile	0	20	0
Greater than 1 to 2 miles	19	20	0
Greater than 2 to 3 miles	11243	20	4
Greater than 3 to 4 miles	24431	20	2
		Total Secondary Population Value	15

Air Pathway Primary Sensitive Environments

Sensitive Environment Name	Reference	Value
None		
Total Primary Sensitive Environments Value		

*** Note : Maximum of 7 Sensitive Environments Are Printed***

Air Pathway Secondary Sensitive Environments

Sensitive Environment Name	Distance	Reference	Value
1 None	onsite		0.0
None			
Total Secondary Sensitive Environments Value			

SITE SCORE CALCULATION	SCORE
GROUND WATER PATHWAY SCORE:	4
SURFACE WATER PATHWAY SCORE:	1
SOIL EXPOSURE PATHWAY SCORE:	2
AIR PATHWAY SCORE:	2
SITE SCORE:	3

SUMMARY

1. Is there a high possibility of a threat to any nearby drinking water well(s) by migration of a hazardous substance in ground water? No

   If yes, identify the well(s).

   If yes, how many people are served by the threatened well(s)? 0

2. Is there a high possibility of a threat to any of the following by hazardous substance migration in surface water?
   - A. Drinking water intake No
   - B. Fishery No
   - C. Sensitive environment (wetland, critical habitat, others) No

   If yes, identity the target(s).

3. Is there a high possibility of an area of surficial contamination within 200 feet of any residence, school, or daycare facility? No

   If yes, identify the properties and estimate the associated population(s)

4. Are there public health concerns at this site that are not addressed by PA scoring considerations? No

   If yes, explain:

REFERENCE LIST

1. Not used

2. USGS. 1982. Aldine, Humble, Maedan, and Spring, Texas (7.5-minute series topographic maps)

3. Not Used

4. Dorsey, K. A. 1995. WESTON. Personal Communication with Chris Davis, Progressive Chemicals and DS Recreational Services. 11 January 1996.

5. Adams Aerial Survey. 1985, 1989, 1992 Aerial photographs

6. Dorsey K.A. WESTON. Field Logbook Notes on Airport Holding A, Houston, Texas. 10 November 1995. WESTON Document Control No. 4603-22-0134.

7. Bureau of Economic Geology, Geological Atlas of Texas (Beaumont and Houston Sheet), University of Texas at Austin, Seventh Printing, 1978.

8. Texas Deaprtment of Water Resources, Water for Texas, Technical Appendix, Volume 2, November 1984.

9. Soil Conservation Service, Soil Survey of Harris County, Texas, 1976.

10. Not Used

11. Not Used

12. Not Used

13. Water Well Location Maps, Texas Natural Resource Conservation Commission, 1995.

14. City of Houston, A Public Water Supply Strategy, 1991.

15. U.S. Geological Survey, 30-by-60 minute series topographical maps of Houston, Texas and Conroe, Texas, 1992.

16. Federal Emergency Management Agency, Flood Insurance Rate Map for the City of Houston, Texas, 28 September 1990.

17. Not Used

18. Not Used

19. Dorsey K.A. WESTON, Personal Communication with Dianna Floss, Texas Parks and Wildlife Deparmtent, 10 January 1996.

20. U.S. Environmental Protection Agency Region IV, Geographic Exposure Modeling System (GEMS), 1990 Census Data

21. Not Used

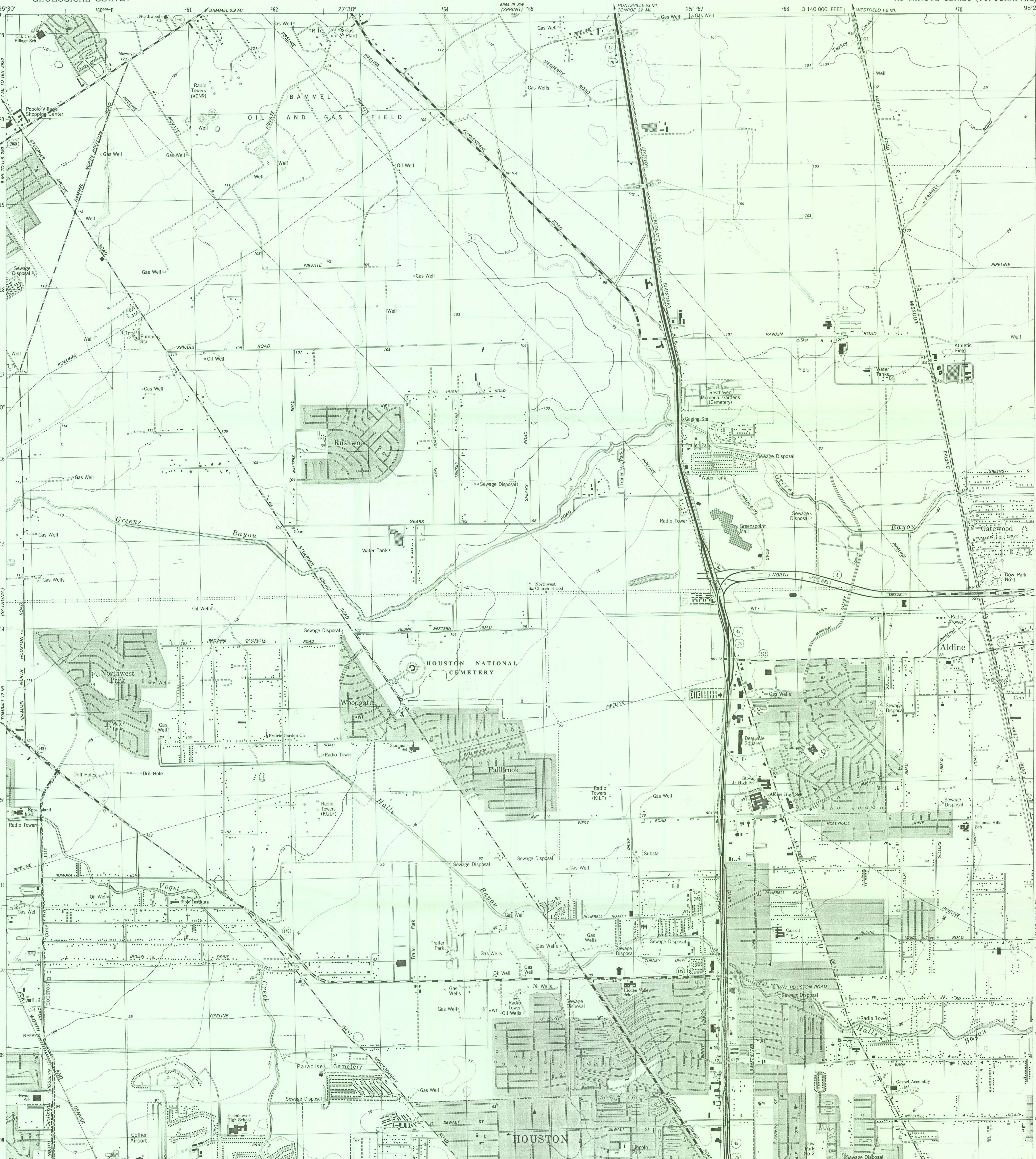
22. Not Used

REFERENCE 1 - Not Used

REFERENCE 2

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ALDINE QUADRANGLE
TEXAS–HARRIS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1976. Field checked 1976. Map edited 1982

Projection and 10,000-foot grid ticks: Texas coordinate system, south central zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 15
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 20 meters south and 22 meters east as shown by dashed corner ticks
Fine red dashed lines indicate selected fence lines
Red tint indicates areas in which only landmark buildings are shown
A portion of this map lies within a subsidence area
Contouring based on 1973 adjustment of vertical control
There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

TEXAS
QUADRANGLE LOCATION

2995–433

ROAD CLASSIFICATION

Primary highway, hard surface | Light-duty road, hard or improved surface
Secondary highway, hard surface | Unimproved road
Interstate Route | U. S. Route | State Route

ALDINE, TEX.
N2952.5–W9522.5/7.5
1982
DMA 6943 IV NW–SERIES V882

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HUMBLE QUADRANGLE
TEXAS—HARRIS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Planimetry by photogrammetric methods from aerial photographs taken 1966. Topography enlarged from 1:31 680-scale AMS map of Humble quadrangle. Original map by planetable surveys 1943. Revised 1967

Polyconic projection. 1927 North American datum
10,000-foot grid based on Texas coordinate system, south central zone
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence lines

UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL

SOLD BY
GAYLORD STICKLE COMPANY & ASSO. INC.
SURVEYING - MAPPING
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U. S. GEOLOGICAL SURVEY MAPS
713-659-7283 HOUSTON, TEXAS

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
U. S. Route
State Route

QUADRANGLE LOCATION

HUMBLE, TEX.
N2952.5—W9515/7.5
1967
AMS 6943 IV NE—SERIES V882

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF TEXAS
TEXAS WATER COMMISSION

MAEDAN QUADRANGLE
TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Planimetry by photogrammetric methods from aerial photographs taken 1957. Topography by planetable surveys 1961

Polyconic projection. 1927 North American datum
10,000-foot grids based on Texas coordinate system, central and south central zones
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1961

SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL

TEXAS
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Heavy-duty Light-duty
Medium-duty Unimproved dirt
U.S. Route

MAEDAN, TEX.
N3000—W9515/7.5
1961

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D.C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SPRING QUADRANGLE
TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1976. Field checked 1976. Map edited 1982

Projection: Texas coordinate system, south central zone (Lambert conformal conic)

10,000-foot grid ticks based on Texas coordinate system, south central and central zones

1000-meter Universal Transverse Mercator grid zone 15

1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 19 meters south and 22 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

Red tint indicates areas in which only landmark buildings are shown

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

A portion of this map lies within a subsidence area

Contouring based on 1973 adjustment of vertical control

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

3095-122

ROAD CLASSIFICATION

Primary highway, hard surface — Light-duty road, hard or improved surface

Secondary highway, hard surface — Unimproved road

Interstate Route — U. S. Route — State Route

SPRING, TEX.

N3000—W9522.5/7.5

1982

DMA 6944 III SW—SERIES V882

REFERENCE 3 - Not Used

REFERENCE 4

WESTON
MANAGERS DESIGNERS/CONSULTANTS

K. DORSEY
Originator

PHONE CONVERSATION RECORD

Conversation with:

Name CHRIS DAVIS
Company PROGRESSIVE CHEMICALS
Address 2510 FARREL ROAD
HOUSTON, TX
Phone 443-7665
Subject AIRPORT HOLDING A

Date 1/11/96
Time 1315 AM (PM)

☒ Originator Placed Call
☐ Originator Received Call
W.O. NO. 04603-022-028-0106

Notes: MR. DAVIS IS THE CURRENT OWNER OF THE PROPERTY. HE HAS OWNED IT FOR ABOUT ONE YEAR.

ACCORDING TO MR. DAVIS AN ESA WAS PERFORMED ON THE SITE BEFORE HE ACQUIRED THE PROPERTY

MR. DAVIS SAID THE COMPANY THAT WAS LOCATED ON THE PROPERTY BEFORE PROGRESSIVE CHEMICALS, MADE PALLETS.

RESULTS OF THE ESA INDICATED NO ENVIRONMENTAL CONCERNS. THE ESA WAS PERFORMED IN JANUARY 1994.

MR. DAVIS SAID THAT ABOUT 12 PEOPLE WORK ON THE PROPERTY. HE SAID NO CONTAMINATION HAS BEEN FOUND ON THE SITE.

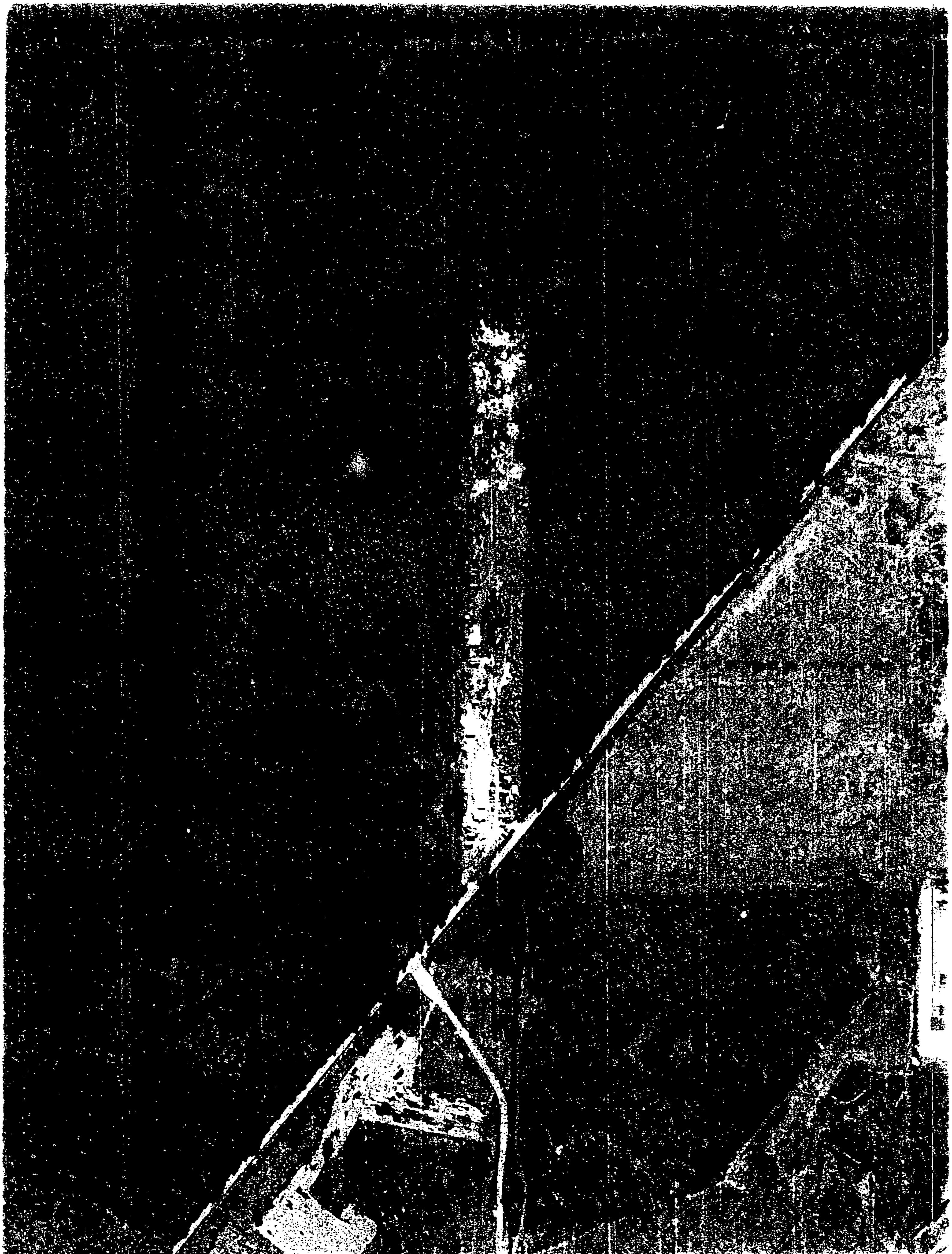
☐ **File**
☐ **Tickle File** / /
☐ **Follow-Up By:**
☐ **Copy/Route To:**

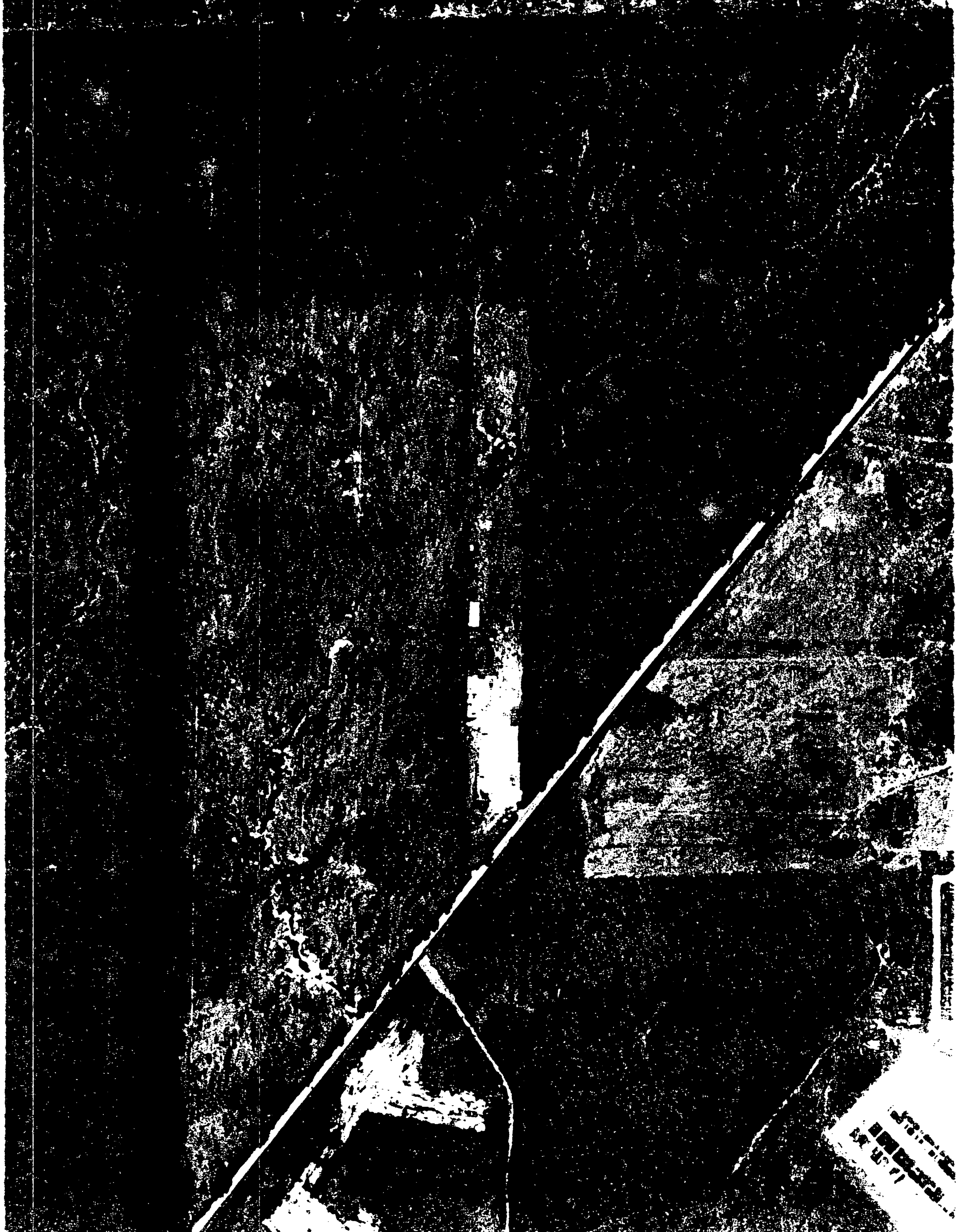
Follow-Up-Action:

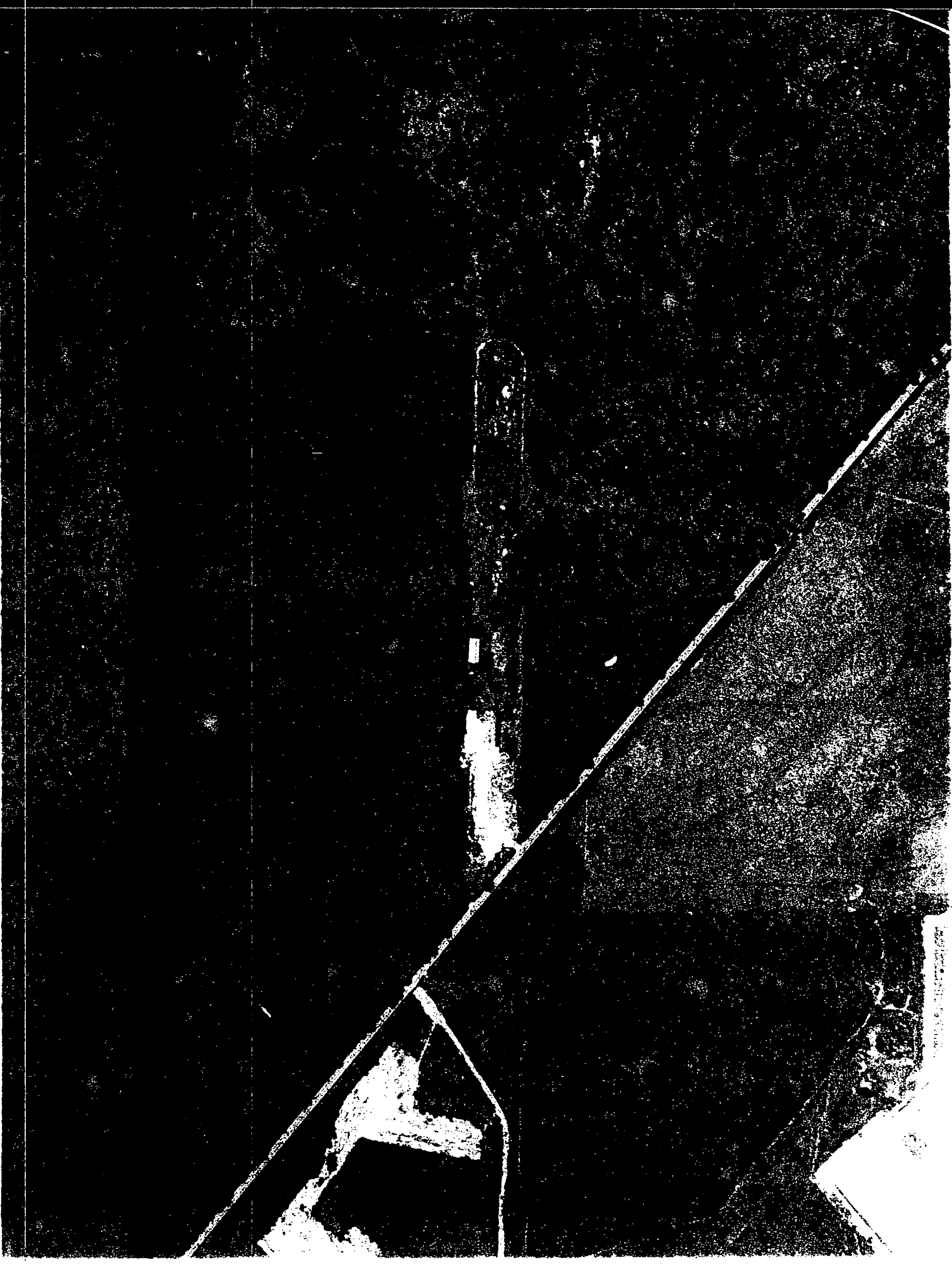
Originator's Initials

RFW 110-4-83

REFERENCE 5







REFERENCE 6

ARCS 1995
Preliminary Assessments
04603-022-034

DIETZGEN

025

ENGINEERS'
FIELD BOOK
No. S400V

7/21/95 Burgess-Norton Eric Tate

All contact for this site will be between Frank Smith + Karen Dorsey (WESTON)

Frank J. Smith
Manager of
Environmental Engineering
[708] 232-3297
Modem [708] 232-3293

BURGESS-NORTON MFG. CO.

[708] 232-4100 FAX [708] 232-3634
737 Peyton Street
Geneva, IL 60134-2189

Amsted

Larry K. Kappel, P.E.
Plant Manager
Ext. 200

BURGESS-NORTON MFG., CO.

[918] 341-8170 FAX [918] 342-0428
2400 E.L. Anderson Boulevard
Claremore, OK 74017-9810

Amsted

Eric Tate

11/10/95 AIRPORT HOLDING A KAREN DORSEY

DS RECREATIONAL SERVICES, INC
PROGRESSIVE CHEMICALS, INC
OPERATING ON PROPERTY
AREA IS FRESHLY PAVED AND NEW TRAILER BUILDINGS ON SITE
BUILDINGS ON SITE HAVE BEEN RENOVATED OR ARE NEW

3-4 RESIDENCES PRESENT JUST EAST OF FARREL / HARDY INTERSECTION ON FARREL

WELDON PINES SUBDIVISION ON WESTFIELD ROAD SE OF SITE.

FARRELL / HARDY ROAD AREA
12 ~~AND~~ HOUSES/TRAILERS

GOLFCOURSE LOCATED JUST WEST OF SITE. CATTLE OBSERVED JUST WEST OF GOLFCOURSE

ACROSS STREET - AND DOWN TO THE WEST. GULF COAST STABILIZED MATERIALS

11/10/95 SOUTHWEST HARDY KAD

VAM PTS
~~INTERNATIONAL~~ DRILLING STRUCTURES
INTERNATIONAL
GATOR HAWK. A
ALL OPERATIONAL

WITHIN ONE MILE: NORTH OF SITE
DUNN ELEMENTARY
NIMITZ H.S.
N HARRIS COUNTY COLLEGE
WOODCREEK RESIDENTIAL AREA IS
NORTH OF NHC COLLEGE

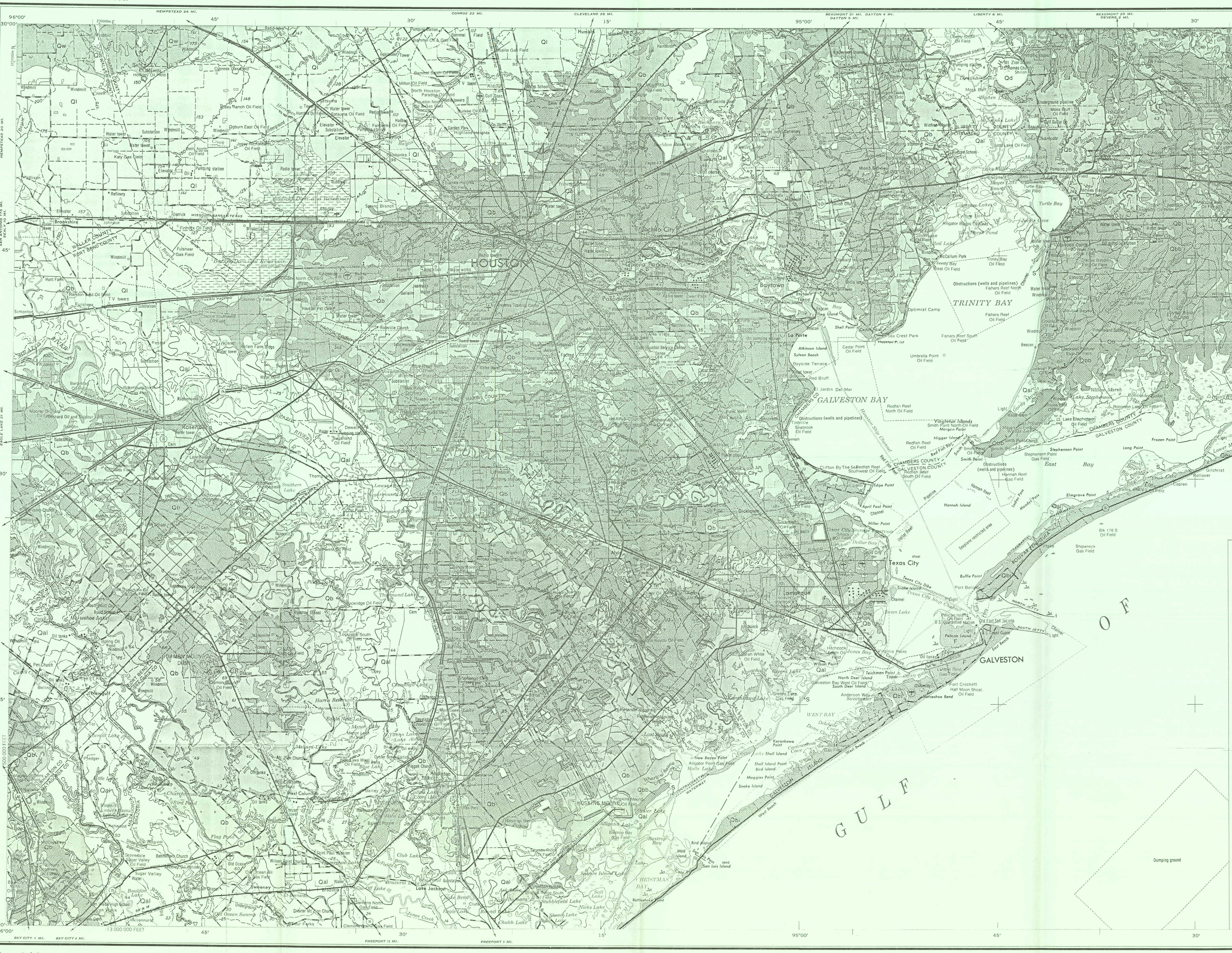
NORTHWOOD MUD # 1 WATER
PLANT @ 20440 ALDINE
WESTFIELD

HARDY TOLL ROAD WEST OF SITE

REFERENCE 7

THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
W. L. FISHER, DIRECTOR

GEOLOGIC ATLAS OF TEXAS
HOUSTON SHEET



EXPLANATION

FS

Fill and spoil

Fill, F, material dredged for raising land surface above alluvium and barrier-island deposits and for creating land. Spoil, S, dredged material along waterways

Qal

Alluvium

Clay, silt, and sand, organic matter abundant locally; includes point-bar, natural levee, stream channel, backswamp, coastal marsh, mud-flat, and narrow beach deposits that are shown by line symbol

Qbi

Barrier-island deposits

Sand, silt, and clay; mostly sand, well-sorted, fine-grained, abundant shells and shell fragments; interfingers with clay and silt in landward direction; includes beach ridge, spit, tidal channel, tidal-delta, and sand dune deposits

Holocene

Qd **Qd?**

Deweyville Formation

Sand, silt, and clay, some gravel; includes point-bar, natural levee, stream channel, and backswamp deposits at a level only slightly above that of the present floodplain; sand coarser than that in alluvium; surface characterized by relict meanders of much larger radius of curvature than those of present streams, some scattered pimple mounds; thickness locally more than 50 feet. High-level Deweyville, Qd?, surfaces cut into the Beaumont Formation, and high-level Deweyville deposits along Trinity River are intermediate in position between the surface of the Beaumont and the level of most Deweyville deposits

Holocene or late (?) Pleistocene

Qbb **Qb** **Qb**

Beaumont Formation

Beaumont Formation, Qb, with barrier-island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, and sand; includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits; concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; thickness ± 100 feet. The stippled overprint (source shown in Index to Geologic Mapping) shows areas that are "Dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity; geologic units include interdistributary muds, abandoned channel-fill muds, and overbank fluvial muds." The nonstippled areas are "Dominantly clayey sand and silt of moderate permeability and drainage, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands"

Barrier-island and beach deposits, Qbb, mostly fine grained sand normally without shell material; surface slightly higher than that of surrounding deposits, characterized by numerous pimple mounds and rounded depressions; probably part of "Ingleside" barrier-island system; thickness less than 30 feet
Physical properties: "Dominantly sand, high to very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, low ridge and depressed relief, high shear strength, and low plasticity. Geologic units include beach, foredunes, barrier-strandplain-chenier vegetated flats, Pleistocene barrier and strandplain sands"

Ql

Lissie Formation

Upper part, clay, silt, sand, and very minor siliceous gravel of granule and small pebble size, gravel more abundant northwestward, locally calcareous, concretions of calcium carbonate, iron oxide, and iron-manganese oxides common in zone of weathering; fluviatile; surface fairly flat and featureless except for numerous rounded shallow depressions and pimple mounds. Lower part, clay, silt, sand, and minor amount of gravel; gravel slightly coarser than in upper part, noncalcareous, iron oxide concretions more abundant than in upper part; fluviatile; very gently rolling; thickness ± 200 feet

Qw

Willis Formation

Clay, silt, sand, and minor siliceous gravel of granule to pebble size including some petrified wood; sand coarser than in younger units. Deeply weathered and lateritic, indurated by clay and cemented by iron oxide locally, concretions of iron oxide numerous, noncalcareous; fluviatile; maximum thickness 75 feet

Pleistocene

QUATERNARY

T

Tertiary rocks on Hockley salt dome

Sandstone, very fine grained, hard, abundant porcelaneous to opaline cement, poorly bedded, jointed, grayish white; possibly Catahoula Formation (Stenzel, 1946) (See Index of Geologic Mapping for reference.)

Miocene

TERTIARY

CR

Outcrop of caprock reported on Damon Mound

Not found. Reportedly used for building stone (Bevier, 1925)

U
D

Fault

U, upthrown; D, downthrown side

10,000-meter Universal Transverse Mercator grid ticks, shown in blue

Partially funded by Texas Department of Water Resources

Houston part of sheet:

Prepared by the Army Map Service (GUDV), Corps of Engineers, U.S. Army, Washington, D.C. Compiled in 1956 from: United States Quadrangles, 1:24,000, U.S. Geological Survey, 1952; Texas, 1:25,000, Army Map Service, 1947-49; United States Quadrangles, 1:31,680, U.S. Geological Survey, 1919-20; USC & GS Charts 1280 and 1282, 1945. Planimetric detail revised by photo-planimetric methods. Control by USGS, CE and USC&GS. Map field checked 1956.

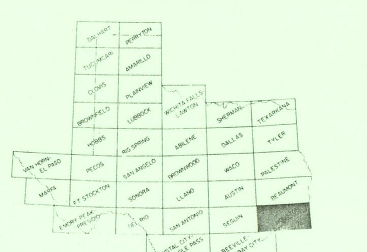
Port Arthur part of sheet:

Prepared by the U. S. Army Map Service (AMSX), Corps of Engineers, Washington, D. C. Compiled in 1956 from: Louisiana, 1:25,000, AMS, Sheet 7243 IV SE, 1943; Texas, 1:25,000, AMS, 1942; Louisiana, 1:50,000, AMS, Sheet 7543 II and III, 1951; USGS large scale compilations, 1952-54; USC&GS Charts 1277, 1955; 1278 and 1279, 1954. Planimetric detail revised by photo-planimetric methods. Horizontal and vertical control by USC&GS, CE and TVA. Map field checked 1956.

VIRGIL E. BARNES, PROJECT DIRECTOR

This revision of the Houston sheet of the Geologic Atlas of Texas relies heavily on recent publications and maps listed in the Index of Geologic Mapping. For credits and sources used for the original 1968 edition of the Houston sheet, the user is referred to that edition of the map. The base for the present edition of the Houston sheet was revised by R. L. Dillon, who also scribed the geologic mapping.

LOCATION MAP



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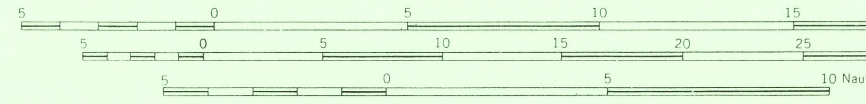


CONTOUR INTERVAL 50 FEET
WITH SUPPLEMENTARY CONTOURS AT 25 FOOT INTERVALS

TRANSVERSE MERCATOR PROJECTION

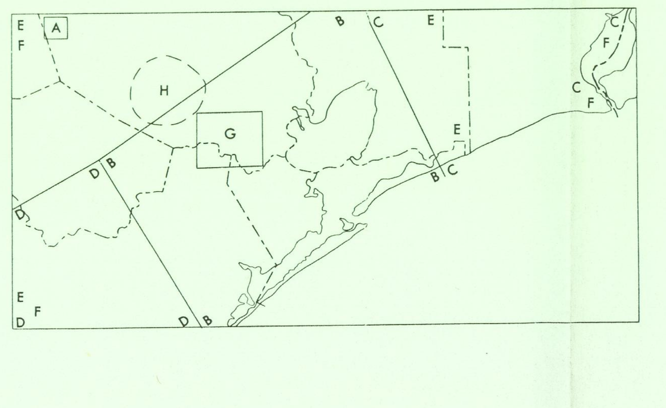
1981 MAGNETIC DECLINATION FOR CENTER OF THIS SHEET IS 6° 00′E. MEAN ANNUAL CHANGE IS 6.3′ WESTERLY

GEOLOGIC ATLAS OF TEXAS, HOUSTON SHEET

PAUL WEAVER MEMORIAL EDITION

REVISED 1982

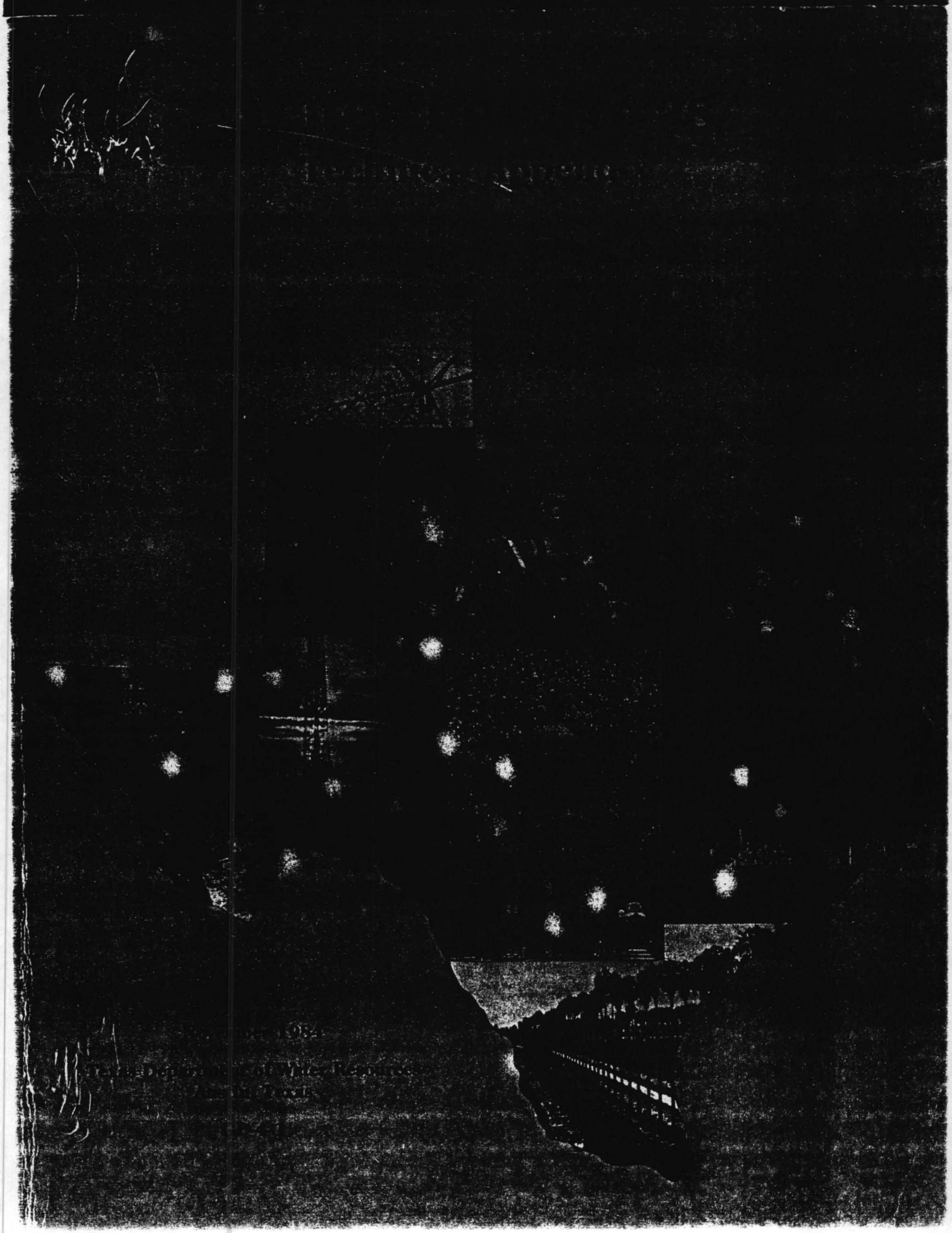
INDEX OF GEOLOGIC MAPPING



For opinion on age of rocks on Hockley salt dome (area **A**), see Deussen, Alexander, and Lane, L. L. (1925) Hockley salt dome, Harris County, Texas: Bulletin of the American Association of Petroleum Geologists, v. 9, p. 1031-1060; and Stenzel, H. B. (1946) Gypsum resources and mining on the Hockley Dome, Harris County, Texas: University of Texas Publication 4301, p. 207-226. For area **B**, see Fisher, W. L., McGowen, J. H., Brown, L. F., Jr., and Groat, C. G. (1972) Environmental geologic atlas of the Texas Coastal Zone--Galveston-Houston area: The University of Texas at Austin, Bureau of Economic Geology. For area **C**, see Fisher, W. L., Brown, L. F., Jr., McGowen, J. H., and Groat, C. G. (1973) Environmental geologic atlas of the Texas Coastal Zone — Beaumont-Port Arthur area: The University of Texas at Austin, Bureau of Economic Geology. For area **D**, see McGowen, J. H., Brown, L. F., Jr., Evans, T. J., Fisher, W. L., and Groat, C. G. (1976) Environmental geologic atlas of the Texas Coastal Zone — Bay City-Freeport area: The University of Texas at Austin, Bureau of Economic Geology. For area **E**, see St. Clair, A. E., Proctor, C. V., Jr., Fisher, W. L., Kreitler, C. W., and McGowen, J. H. (1975) Land and water resources — Houston-Galveston Area Council: The University of Texas at Austin, Bureau of Economic Geology. For area **F**, see Kier, R. S., Garner, L. E., and Brown, L. F., Jr. (1977) Land resources of Texas: The University of Texas at Austin, Bureau of Economic Geology. For area **G**, see Verbeek, E. R., and Clanton, U. S. (1978) Map showing surface faults in southeastern Houston metropolitan area, Texas: U.S. Geological Survey Open-File Report 78-797. For area **H**, see Verbeek, E. R., Ratzlaff, K. W., and Clanton, U. S. (1979) Faults in parts of north-central and western Houston metropolitan area, Texas: U.S. Geological Survey, Miscellaneous Field Studies, Map MF-1136. For references concerning caprock on Damon Mound, see Veatch, A. C., in Hays, C. W., and Kennedy, William (1903) Oil fields of the Texas-Louisiana Gulf Coastal Plain: U.S. Geological Survey Professional Paper 126, p. 137; and Bevier, G. M. (1925) The Damon Mound oil field, Texas: Bulletin of the American Association of Petroleum Geologists, v. 9, p. 523.

REFERENCE 8

Technical Appendix



1984

Texas Department of Water Resources

Austin, Texas

TABLE OF CONTENTS

TABLE OF CONTENTS—Continued

10. SAN JACINTO RIVER BASIN

BACKGROUND AND CURRENT CONDITIONS

Physical Description

The San Jacinto River Basin is bounded on the north and east by the Trinity River Basin and the Trinity-San Jacinto Coastal Basin, on the west by the Brazos River Basin, and on the south by the San Jacinto-Brazos Coastal Basin. Total basin drainage area is 5,600 square miles. Principal drainage systems in the basin are the San Jacinto River and Buffalo Bayou which drain into Galveston Bay through the Houston Ship Channel. Drainage area of the San Jacinto River above the confluence of the East and West Forks is 2,800 square miles, of which 1,750 square miles is in the West Fork drainage area and 1,050 square miles is in the East Fork drainage area. Originating at an elevation of 44 feet, Buffalo Bayou has a drainage area of 1,034 square miles. For planning purposes, the basin is treated as a single hydrologic unit (Figure III-10-1).

Surface Water

Average runoff for the period 1941 through 1970 in the basin was about 440 acre-feet per square mile. The lowest consecutive annual flows in the eastern part of the basin during the 1941-70 period occurred during 1954-56 and 1962-63. The average runoff was 125 acre-feet per square mile during 1954-56 and 224 acre-feet per square mile during 1962-63. The lowest runoff rate occurred in 1956 and averaged 70 acre-feet per square mile.

The San Jacinto River Basin is subject to intense rainstorms in every season of the year, with many of the most severe storms coming in the late summer and early autumn when tropical weather disturbances move inland out of the Gulf of Mexico.

Flooding is not confined to the San Jacinto River. Many of its principal tributaries are sources of massive flood problems. Buffalo Bayou, Brays Bayou, Sims Bayou, and Clear Creek are tributaries which are frequently sources of extensive damage to urban developments. Continued land subsidence aggravates this flood problem and increases the limits of flooding.

Urban development has increased the intensity of surface runoff to the point that many existing drainage systems are no longer capable of conveying flood waters from flooded areas. When bayous overflow in the Houston area, extensive damage results.

The San Jacinto River Basin exhibits wide variations in water quality. The upper part of the West Fork San Jacinto River flows into Lake Conroe, which supplies high-quality water to the area and also serves as a recreational resource. Occasional elevated levels of nutrients and bacteria have been noted in recent data from the West Fork San Jacinto River. The East Fork San Jacinto River, along with Peach Creek and Caney Creek, contribute consistently good-quality water to Lake Houston, which currently serves as the City of Houston's primary surface-water supply. Lake Houston also receives inflows from Cypress Creek and Spring Creek, which contain significant amounts of return flows. As the Houston metroplex has expanded toward the north, a proliferation of small sewage treatment plants has increased the nutrient loadings to Cypress Creek and Spring Creek and has caused localized dissolved-oxygen deficiencies. Although Lake Houston has a high nutrient concentration, the high turbidity level precludes the development of an intensive phytoplankton community.

The San Jacinto River flows approximately 20 miles from Lake Houston to its confluence with the upper portion of the Houston Ship Channel. The river then flows another 10 miles into Galveston Bay at Morgan's Point. Discharges from industries and municipalities, including the City of Houston's Northside and Sims Bayou sewage treatment plants, impact the quality of the lower San Jacinto River-Houston Ship Channel system. The upper part of the Houston Ship Channel is suitable for navigation and industrial water supply, but the water quality improves markedly below the San Jacinto River confluence and is adequate for most intended purposes, including fishing and recreation.

Ground Water

The Gulf Coast Aquifer underlies the entire San Jacinto River Basin. The aquifer extends to a maximum depth of about 3,000 feet. Yields of large-capacity wells average about 1,800 gallons per minute (gpm), but locally wells produce up to 2,900 gpm. The water in the aquifer generally contains less than 500 milligrams per liter (mg/l) total dissolved solids.

Importation of water from the Trinity River has decreased significantly the potential for additional land-surface subsidence and saline-water encroachment into

Figure III-10-1. San Jacinto River Basin

the Gulf Coast Aquifer in the eastern Houston and Pasadena areas along the Houston Ship Channel.

Population and Economic Development

The population of the San Jacinto River Basin was reported at 2.4 million in 1980. At present, 92 percent of the basin population resides in Harris County. Houston is the largest city, with over 1.5 million of its population within the San Jacinto River Basin. Other principal cities in the basin include Pasadena and Bellaire in Harris County, and Conroe in Montgomery County. The San Jacinto River Basin ranks much higher than the statewide average in percent urban and population density.

The economy of the basin is based on chemical and petrochemical manufacturing, oil production, diversified manufacturing, agribusiness, and shipping activities associated with the Port of Houston complex, the third largest port in the nation. The City of Houston is a leading center of banking and financial activity and wholesale and retail trade. Recreation, tourism, and convention business round out the highly diversified economy of the basin.

Water Use

Municipal freshwater use in the San Jacinto River Basin totaled 476.8 thousand acre-feet in 1980, and approximately 93 percent of total municipal use occurred in Harris County. An estimated 65 percent of total basin municipal water use in 1980 was supplied from ground water.

In 1980, freshwater use by manufacturing industries in the San Jacinto River Basin amounted to 227.6 thousand acre-feet. This represents about 15 percent of total manufacturing water use in the State in 1980. A significant part of this use occurred in, and adjacent to, the City of Houston, which has the largest number of manufacturing establishments of any city in Texas. Almost 79 percent, or 176.5 thousand acre-feet of the total 1980 manufacturing use, was derived from surface-water sources, while 51.1 thousand acre-feet was obtained from ground-water sources. Manufacturing industries in the basin which use significant quantities of freshwater include paper and allied products, chemicals, petroleum refining, and primary metals.

In 1980, there was 1,996 megawatts of installed steam-electric power generating capacity in the San Jacinto River Basin, which used 15.9 thousand acre-feet of ground water and 7.0 thousand acre-feet of fresh surface water. In addition large volumes of saline water was used for cooling.

In 1980, about 35.3 thousand acres was irrigated with 86.7 thousand acre-feet of water in the basin. About 96 percent was irrigated with ground water from the Gulf Coast Aquifer. The major crop irrigated was rice. Some soybeans and grain sorghum are grown as dryland crops. Urban and industrial development have significantly encroached upon agricultural lands in Harris and Montgomery Counties utilizing some of the best agricultural land for homesites, subdivisions, and industrial developments.

Mining water use in the San Jacinto River Basin was estimated at 5.5 thousand acre-feet in 1980. The most intensive use of water is concentrated in nonmetal mining industries, primarily Frasch sulfur production.

Livestock water requirements in 1980 amounted to about 2,400 acre-feet in the San Jacinto River Basin, principally in the production of cattle. About 1,100 acre-feet of the water used was supplied by surface-water sources.

The portion of the Houston Ship Channel which occupies the San Jacinto River and Buffalo Bayou is located in the San Jacinto River Basin. This marine navigation facility has no regulated freshwater requirements.

Return Flows

In 1980, municipal and manufacturing return flows in the San Jacinto River Basin exceeded 315 thousand acre-feet and 162 thousand acre-feet, respectively. Over 97 percent of these return flows originated in the heavily populated and industrialized areas of Harris County.

Irrigation return flows in 1980 were estimated to total 34.5 thousand acre-feet. These return flows represent 35 to 40 percent of the water used in irrigation of rice land. Most return flows are not recoverable for reuse since they are discharged into saline waters near the Coast.

Current Ground-Water Development

Approximately 466.5 thousand acre-feet of ground water was used in 1980 in the San Jacinto River Basin. All of the ground water used in the basin was from the Gulf Coast Aquifer.

Of the 466.5 thousand acre-feet of ground water used in the basin, about 309.8 thousand acre-feet or 66 percent was for municipal purposes, 82.9 thousand acre-feet or 18 percent was for irrigation purposes, and 51.1 thousand acre-feet or 11 percent was for manufacturing purposes.

Within the basin, an extremely large overdraft of ground water from the Gulf Coast Aquifer occurred in

1980 due primarily to excessive withdrawals for municipal purposes generally in central and western Harris County. This extremely large overdraft has caused significant water level declines, compaction of clays within the Gulf Coast Aquifer, and consequently, an increase in the rate of land-surface subsidence and probably fault movement in the western and southwestern portion of Harris County. Within the basin, a significant overdraft of ground water from the Gulf Coast Aquifer occurred in 1980 in Waller County, due to excessive withdrawals for irrigation purposes.

Current Surface-Water Development

Major reservoirs and impoundments in the San Jacinto River Basin include Lakes Conroe and Houston, Lewis Creek and Sheldon Reservoirs, and Addicks and Barker flood control dams. Lake Conroe, owned and operated by the San Jacinto River Authority, presently provides municipal and manufacturing water supplies for the City of Houston through releases to Lake Houston. The City of Houston has rights to two-thirds of the storage in Lake Conroe. Water is also diverted from Lake Conroe to Lewis Creek Reservoir, owned by Gulf States Utilities Co., to provide make-up water for consumptive use due to operation of the Lewis Creek steam-electric power plant.

Lake Houston is owned and operated by the City of Houston. The San Jacinto River Authority, which holds prior water rights to the low flows of the main-stem San Jacinto River, diverts raw water directly from Lake Houston, through an agreement with the City of Houston, to industrial plants in the Baytown area in the Trinity-San Jacinto Coastal Basin and for irrigation. Highlands Reservoir, owned by the San Jacinto River Authority, is used for regulation of these deliveries, which totaled about 47 thousand acre-feet for industrial use and 8 thousand acre-feet for irrigation purposes in 1980. Raw water is also conveyed from Lake Houston to a number of industries in Harris County and to the Galveston County Water Authority in Galveston County through contractual agreements with the City of Houston. Treated water from Lake Houston is utilized by the City of Houston and its present customers, which include the City of Galveston, Galveston County Water Authority, and the City of Pasadena. In 1980, in addition to the 246.1 thousand acre-feet of ground water pumped by the City of Houston from its well fields completed in the Gulf Coast Aquifer, 195.8 thousand acre-feet of water was diverted from Lake Houston by the city. A large portion of this amount was conveyed directly to industrial users, including a large paper mill and Houston Lighting and Power Company. The remainder was treated at the city's Federal Road Water Treatment Plant prior to use by the city and its customers.

Sheldon Reservoir is owned and operated by the Texas Parks and Wildlife Department for purposes of recreation, wildlife management, and as a fish hatchery. Addicks Dam and Barker Dam were constructed by the U.S. Army Corps of Engineers and are operated for flood control. These projects have no conservation storage pools.

The Coastal Industrial Water Authority (CIWA) pumping and conveyance system, designed to deliver water from the Trinity River Basin to the major industrial areas of the San Jacinto River Basin, is nearing completion. The CIWA Main Canal System (22 miles long) to the principal regulating reservoir, Lynchburg Reservoir, and much of the distribution system which will serve industrial complexes in the Houston Ship Channel, Bayport, La Porte, Clear Lake, Pasadena, and Galena Park areas, as well as future municipal needs, have been completed.

The CIWA System delivers part of the City of Houston share of the yield of Lake Livingston and the supplies provided under prior water rights associated with the former Southern Canal Company, into the Trinity-San Jacinto Coastal Basin, the San Jacinto River Basin, and the San Jacinto-Brazos Coastal Basin. The CIWA System, when fully completed, will have the capability of delivering an average of about 1.39 million acre-feet annually from the pumping station on the Trinity River, of which about 235 million gallons per day (263.2 thousand acre-feet per year) will be delivered through the Cedar Point Lateral System (formerly the Southern Canal Company canal system) to industrial users and irrigated areas in the Trinity-San Jacinto Coastal Basin.

Water Rights

A total of 691,961 acre-feet of surface water was authorized or claimed for diversion and use in the San Jacinto River Basin as of December 31, 1983 (Table III-10-1). Authorized and claimed diversions for municipal use accounted for 231,000 acre-feet or about 33 percent of the total amount of water authorized or claimed in the basin (Table III-10-2).

Water Quality

The Houston metropolitan area is drained almost entirely by Buffalo Bayou, which has been channelized to form the Houston Ship Channel in its lower reach. The channel now receives heavy pollution loadings of both municipal and industrial wastes. These heavy waste loads, together with the sluggish flow characteristics of the waterway and tidal action, have overloaded the natural waste-assimilative capacity of the channel.

Table III-10-1. Authorized or Claimed Amount of Water, by Type of Right, San Jacinto River Basin[1]

Type of Authorization	Number of Rights	Acre-Feet Authorized and Claimed
Permits	76	686,574
Claims	16	5,387
Certified Filings	0	0
Certificates of Adjudication	0	0
Total Authorizations and Claims	92	691,961

[1]The Texas Water Rights Adjudication Act of 1967 authorizes the Texas Department of Water Resources to investigate and determine, with the Court's approval, the nature and measure of water rights for all authorized diversions from surface-water streams or portions thereof except domestic and livestock uses and to monitor and administer each adjudicated water right. These totals incorporate the results of water-rights adjudication in the basin as of December 31, 1983. These totals do not include 9 authorized diversions of saline water amounting to 2,734,931 acre-feet/year. Certified Filings are declarations of appropriation which were filed with the State Board of Water Engineers under the provisions of Section 14, Chapter 171, General Laws, Acts of the 33rd Legislature, 1913, as amended. Permits are statutory appropriative rights which have been issued by the Texas Water Commission or its predecessor agencies. Claims are sworn statements of historical uses to be adjudicated in accordance with the Texas Water Rights Adjudication Act. A certificate of adjudication is the final result after recognition of a valid right in the adjudication process and is based on a permit, certified filing or claim or any combination of the three.

Certain areas within the basin experience periodic algal blooms as a result of high nutrient concentrations. This is partly a response to natural conditions, but is aggravated by municipal and industrial point source nutrients. Several areas in the basin experience water quality problems resulting from natural runoff of largely uncontrollable nonpoint sources of pollutants. The high turbidity and coloration of the waters of Lake Houston and slightly depressed dissolved-oxygen levels in the East Fork flows are considered to be largely attributed to point source discharges into the tributaries of the lake, especially Cypress Creek and Spring Creek.

Table III-10-2. Authorized or Claimed Amount of Water, by Type of Use, in Acre-Feet, San Jacinto River Basin

Type of Use	Number of Rights	Basin Total
Municipal	3	231,000
Industrial[2]	11	427,112
Irrigation	35	20,835
Mining	1	5,500
Recreation	47	7,514
Total	92[1]	691,961

[1]Does not sum due to multipurpose "rights", which may be applied to more than one type of use.

[2]Does not include 9 authorized diversions of saline water amounting to 2,734,931 acre-feet/year.

Flooding, Drainage, and Subsidence

Due to extensive use of flood plains for high value developments, flood damages have been extremely severe in the basin. Hurricane Carla (1961) caused in excess of $21 million in damages to nonagricultural properties in Harris County. In 1972, a heavy rainstorm in the City of Houston caused an estimated $5 million in damages to urban development. A flood in June 1973, was so severe that an area including Galveston, Harris, Liberty, Montgomery, and San Jacinto Counties was declared a disaster area by the President.

In June 1975, an intense thunderstorm centered over Sims Bayou in the southern part of Houston resulting in damages estimated at $8.8 million. One month later, a similar flood, again centered in Sims Bayou, caused an additional $2.6 million in damages. A year later, a thunderstorm dropped 14 inches of rain, causing extensive flooding along Sims and Brays Bayous and produced total flood damages estimated near $20 million. Ponded floodwaters damaged areas which were previously unharmed by flooding. The huge medical complex in the southern part of Houston suffered an estimated $15 million in damages when ponded water poured into basement storage areas. Flood-proofing of the complex was undertaken to prevent recurrence of this flooding.

The year 1979 will go down in history as one of the most disastrous flood years in the basin. Floods in April 1979, Tropical Storm Claudette in July 1979, and floods in September 1979 resulted in three Presidential disaster declarations for the basin. More than $2.1 million was spent by various federal agencies for flood relief. In 1979, 6,093 flood insurance claims were filed for $64.4 million in flood damages. Flooding in 1981 produced 3,665 flood insurance claims for $28.2 million in flood damages. Less serious flooding in 1977, 1978, and 1980 produced an additional 426 flood insurance claims for $1.9 million in flood damages.

Forty-one cities in the basin have been designated by the Federal Emergency Management Agency as having one or more flood-prone areas. Thirty-three of these cities have adopted flood-plain management controls and are participating in the National Flood Insurance Program. Nineteen flood insurance rate studies have been completed in the basin and additional studies are in progress to convert most of the remaining cities to the Regular Program.

Rapidly changing land use has brought about many complicated drainage problems. Much land area is characterized by low permeability and the lack of well-defined drainage channels for rapid discharge of floodwaters. Urban developments require extensive planning for adequate drainage systems. Development in some areas has created or aggravated downstream drainage problems, and in many cases has created new wetland areas. Increased surface runoff from urbanization has overtaxed major drain outlets, resulting in flooding of land previously free from inundation. An example is the recent flood and drainage problems experienced along Sims and Brays Bayous in Harris County.

Since 1906, land subsidence ranging from approximately six inches to more than nine feet, has occurred in Harris, Montgomery, and Liberty Counties. Subsidence is least in the central and northern portions of the basin. More than nine feet of subsidence has occurred in Pasadena along the Houston Ship Channel due to clay compaction caused by ground-water withdrawals from the Gulf Coast Aquifer for industrial needs. Fault activation and movement are associated with subsidence within the basin. In Harris County, rates of vertical displacement along active faults have been observed to be from 0.012 to 0.111 foot per year. In urban and industrialized areas of the basin, active faults have caused severe damage to buildings, streets, highways, airport runways, railroads, and various pipeline systems. Along 95 miles of active faults in the Houston area, the total cost of damage to homes in the early 1970's was estimated to be over $2.6 million. Also in the Houston area, repair of damage to highways, railroads, pipelines, and storm and sanitary sewers was estimated to cost about $140 thousand annually. Subsidence and faulting within the basin are also caused by withdrawals of petroleum and saline ground water. To stop subsidence and faulting due to ground-water withdrawals, large supplies of surface water are being conveyed from the Trinity River and Lake Houston to eastern Harris County. However, significant rises of the land surface will not occur, since ground water cannot reenter the compacted clays.

There are indications that ground-water pumpage is increasing in the southwestern portion of the basin because of westward growth of the City of Houston. At this time there are no facilities to distribute surface waters to this area. For example, during the 1970's, pumpage in eastern Harris County decreased 47 percent, while pumpage in western Harris, northern Fort Bend, and eastern Waller Counties increased 26 percent. Municipal pumpage in the southwestern portion of the basin increased 730 percent during the 1970's. If this trend continues, subsidence and active faulting are expected to increase in the southwestern portion of the San Jacinto River Basin. For example, the area had about 1.4 feet of subsidence between 1943 and 1978. Between 1973 and 1978, about 0.50 foot or 36 percent of the 1.4 feet of subsidence occurred.

Recreation Resources

In addition to the San Jacinto River, major freshwater recreation resources in the basin include Lake Houston (12.2 thousand surface acres), Sheldon Reservoir (1.7 thousand surface acres), Lake Conroe (21 thousand surface acres), and Buffalo Bayou.

PROJECTED WATER REQUIREMENTS

Population Growth

The population of the San Jacinto River Basin is projected to grow 153 percent by 2030, from the present 2.4 million, which is 17 percent of the State population, to 6 million, 18 percent of the State population (Table III-10-3). A 56 percent increase to 3.7 million is expected from 1980 to the year 2000, and an even larger growth of 62 percent is anticipated from 2000 to 2030.

Harris County contains 92 percent of the basin population. From 1980 to 2030, the Harris County in-basin population is projected to increase 130 percent, but Harris County's percentage of basin population is expected to decline to 83 percent. Montgomery County population is expected to increase sixfold to 794.2 thousand by 2030, thereby increasing its percentage of basin population from 5.4 percent to 13.1 percent.

Water Requirements

Municipal

Municipal water requirements are projected for two cases of future growth based on both population and per capita water use. Water requirements in the San Jacinto River Basin were 476.8 thousand acre-feet in 1980.

Municipal requirements are projected to reach from 609.4 to 887.8 thousand acre-feet by year 2000. From 2000 to 2030, water needs are projected to increase 45-63 percent. The year 2000 and 2030 estimates are about 17 percent of total statewide municipal water requirement.

Industrial

Manufacturing water requirements in 1980 were 227.6 thousand acre-feet in the San Jacinto River Basin. Projections of future water requirements for manufacturing purposes were made by decade and for a low and high case for each industrial group. In 1980, over 90 percent of total manufacturing water use was concentrated in five industrial groups: chemicals, petroleum refining, primary metals, paper products, and food products. Because of this concentration, careful attention was given to the future growth outlook for these industries in making the projections.

Manufacturing water requirements in the San Jacinto River Basin are expected to almost double by the year 2030 to a potential high of 678 thousand acre-feet by 2030.

Approximately 15 percent of the statewide manufacturing water requirements in 1980 is centered in the San Jacinto River Basin, and this percentage is expected to be 13 percent by 2030. In 1980, almost all of the manufacturing water requirements in the San Jacinto River Basin was in Harris County, and this trend is expected to continue.

Major water users in the Harris County portion of the basin are petroleum refineries, industrial organic chemical producers, plastic materials and synthetics plants, and agricultural chemical manufacturers.

Steam-Electric Power Generation

Water requirements for steam-electric power generation will expand rapidly in the San Jacinto River Basin, with a projected significant increase in the use of saline water. Combined annual ground-water withdrawals could reach 50 thousand acre-feet annually in 2030, plus saline-water consumption for steam-electric power plant cooling (Table III-10-3).

Current efforts to reduce ground-water pumpage in the Houston area to avoid increasing land subsidence will affect future ground-water use by steam-electric power plants. The result will be an even more rapid shift from from ground-water sources to saline and fresh surface-water sources. If saline surface-water sources are chosen, it is also probable that future plants will be located in coastal basins rather than in the San Jacinto River Basin.

Technological innovations and concerted water-conservation efforts may alter this case; however, the use of saline water for cooling will still be the most effective means of conserving freshwater. Despite innovation and conservation, some freshwater will be needed at electrical generating plants to provide for boiler feedwater makeup and sanitary and maintenance uses. These freshwater requirements are very small when compared to cooling water requirements; however, if the plant is a coal- or lignite-fired power plant, freshwater requirements for dust control and especially stackgas scrubbing for sulfur dioxide control could be signficant.

Agriculture

Irrigation

Irrigation water requirements were projected for two cases of change based on improvements in on-farm application efficiencies, reduction in ditch losses, changes in future resource costs and crop prices, and corresponding changes in cropping patterns to reflect more profitable crops. A low case projects demand for water based on the effects of changes in the above variables but with irrigated acreage held constant at 1980 levels in each zone for each future time period; a high case projects demand for water for irrigation constrained only by the requirement that irrigated farming produce a net positive return in excess of that possible from dryland farming and the requirement not to exceed the amount of irrigable soil in each zone. Thus, the projections of demand, low and high cases, based on the irrigation efficiency and market conditions mentioned above, give an estimate of the quantity of water needed for irrigation in each zone, at each decadal point for which projections were made. These projections of demand are compared to the projected supply of water locally available. When projected demand exceeds projected supply, the difference is a measure of shortage at that point in time.

Irrigation water requirements in the San Jacinto River Basin are projected to decrease a maximum of 30 percent from the 1980 level of 86.7 thousand acre-feet to 60.7 thousand by the year 2000 in the high and low cases. By 2030, water requirements in the basin are projected to be about 46.9 thousand acre-feet annually in the low and high cases to irrigate about 18.9 thousand acres.

Livestock

Small increases in livestock production are expected to develop in the basin. The projected annual livestock water requirement in 2030 is almost 3 thousand acre-feet. From the 1980 level of 2.4 thousand acre-feet, livestock water requirements are expected to gradually increase by 25 percent by 2030.

Mining

Between 1980 and 2030, mining water use in the San Jacinto River Basin is projected to increase from 5.5 thousand acre-feet to 6.6 thousand acre-feet. The basin share of total State mining water requirements is two percent in 1980 and is projected to maintain this percentage to the year 2030.

Water requirements by fuel mining industries engaged in secondary recovery of petroleum and natural gas are projected to account for 16 percent of the total increase in San Jacinto River Basin mining water requirements in 2030. Nonmetal mining water use is expected to increase from 3 thousand acre-feet in 1980 to 5.6 thousand acre-feet in 2030.

Navigation

No provisions are required for water supply to serve navigation in the San Jacinto River Basin. All navigation is in the coastal waters of the Houston Ship Channel, which has no freshwater lockage requirements.

Hydroelectric Power

There are no hydroelectric power generating facilities planned in the San Jacinto River Basin.

Estuarine Freshwater Inflows

The San Jacinto River discharges into the Trinity-San Jacinto estuary. An estimated 1.44 million acre-feet per year of gaged inflow from the San Jacinto River Basin, plus 666 thousand acre-feet of inflow from ungaged areas of the basin, to the Galveston Bay portion of this estuarine system is needed to sustain desired salinity limits for the Subsistence Alternative (Table III-10-4). Estimated gaged river inflows of 1.7 million acre-feet per year are needed from the San Jacinto River Basin, in addition to 693 thousand acre-feet annually of ungaged inflow from the basin, to meet salinity needs and maintain annual commercial fisheries harvests at no less than average historic levels for the 1962-1976 period (Harvest Maintenance Alternative) (Table III-10-4). The estimated gaged freshwater inflows needed from the San Jacinto River Basin for meeting the Fisheries Harvest Enhancement Alternative of maximizing shrimp production in the adjacent offshore area (Gulf Area No. 18) equals the annual inflow limit set at the average (1941-1976) annual gaged basin inflow. This inflow volume is slightly less than 1.6 million acre-feet (Table III-10-4). Ungaged inflows from the basin for this alternative are estimated at 693 thousand acre-feet. An estimated 398 thousand acre-feet per year of gaged inflow from the San Jacinto River Basin is needed for the Biotic Species Viability Alternative to maintain the monthly salinity limits (Table III-10-4).

WATER SUPPLY PROJECTS AND MEASURES TO MEET FUTURE BASIN NEEDS

Ground-Water Availability and Proposed Development

The approximate annual ground-water yield within the San Jacinto River Basin through the year 2030 is 337 thousand acre-feet. This supply is from the Gulf Coast Aquifer which is the only fresh to slightly saline water-bearing formation within the basin.

The projected annual ground-water use within the San Jacinto River Basin by decades from 1990 through 2030 is expected to be from 300.3 to 310.3 thousand acre-feet per year (Table III-10-3). The average ground-water use within the basin is expected to be about 305.6 thousand acre-feet per year.

Surface-Water Availability and Proposed Development

Based only on existing water supply sources, shortages are expected in the San Jacinto River Basin beginning around the year 2010. However, under the proposed development for surface-water supplies to meet these anticipated shortages, the San Jacinto River Basin will have a net surplus of surface water in all decades through the year 2030 (Table III-10-5, Figure III-10-2). The projected annual surplus for all purposes amounts to 201.2 thousand acre-feet in 2000 and 95.4 thousand acre-feet in 2030. Yet, due to local limitations on ground water, irrigation water will be in short supply by about 17.9 thousand acre-feet in 2030. To meet all needs, water would have to be imported annually into the basin at the rate of 868.1 thousand acre-feet in 2000 and 1.57 million acre-feet by 2030.

The population growth of the Houston metropolitan area will necessitate additional water supplies for meeting the manufacturing and municipal needs of the basin by the year 2010. Anticipated needs up to the year 2010 can be met through the development of the Luce Bayou diversion project which will convey water from below Lake Livingston on the Trinity River to Lake Houston in the San Jacinto River Basin for the City of Houston and adjacent suburban areas.

Table III-10-4. Gaged River Inflow Needs of the Trinity-San Jacinto Estuary From the San Jacinto River Basin Under Four Alternative Levels of Fisheries Productivity[1]

	San Jacinto River Basin[2]			
Month	Ecosystem Subsistence	Fisheries Harvest Maintenance	Shrimp Harvest Enhancement	Biotic Species Viability
January	181.5	181.5	181.5	24.4
February	153.0	153.0	153.0	10.6
March	110.6	110.6	110.6	18.2
April	154.5	154.5	154.5	55.2
May	197.0	197.0	197.0	49.3
June	124.1	124.1	124.1	30.9
July	85.4	85.4	182.5	37.1
August	84.4	84.4	117.5	24.8
September	98.0	98.0	98.0	59.0
October	57.0	57.0	57.0	42.4
November	52.9	230.5	52.9	19.3
December	139.0	224.4	139.0	26.8
Annual	1,437.4	1,700.4	1,570.6	398.0

[1]All inflows are mean monthly values in thousand acre-feet.
[2]San Jacinto River Basin inflow represents spills from Lake Houston plus downstream contributions from gaged bayous.

The permitted Luce Bayou diversion project, currently in the advanced planning and design stage by the City of Houston, will provide when completed, the capability for delivery of the remainder of the city's share of the Lake Livingston water supply. The project, as presently designed, will consist of a pumping station on the main stem of the Trinity River approximately 10 miles north of Liberty in Liberty County, a combined 96-inch diameter pipeline and 14 thousand-foot long open canal system extending across the Trinity-San Jacinto River Basin divide to the headwaters of Luce Bayou in the San Jacinto River Basin, and the bed and banks of Luce Bayou which flows into Lake Houston. The Luce Bayou diversion project will be capable of delivering up to 450 thousand acre-feet of water annually into Lake Houston—400 thousand acre-feet for municipal use and 50 thousand acre-feet for industrial purposes. The project is needed before 1990.

A significant portion of the projected manufacturing water needs in the Houston Ship Channel area could be satisfied in an economical manner through the reuse of municipal effluent from the City of Houston. Cost studies have indicated that 100 thousand acre-feet per year of municipal wastewater could be provided, at prices comparable to existing manufacturing water delivery systems, to major manufacturing water users along the Houston Ship Channel by the year 2000. This reuse would likely occur after full utilization of supplies provided by the Luce Bayou project and the Coastal Industrial Water Authority Canal.

By the year 2010, water will be needed from additional sources to avoid shortages in the San Jacinto River Basin. Several potential reservoir sites exist in the basin, and extensive studies of the feasibility and yields of these potential projects have been performed. Projects previously given serious consideration include the Lake Creek, Lower East Fork, and Cleveland Reservoir sites. However, urban and industrial development, the attendant escalating land costs associated with such development, and structural problems present at one site present serious difficulties for the economical development of these sites. The U.S. Bureau of Reclamation is currently studying the water resources of the basin to determine any viable major reservoir sites that could increase the basin's water supply storage.

Additional firm supplies are potentially available from the Trinity River Basin should the authorized Tennessee Colony Reservoir project be constructed. Agreements would have to be reached with local sponsors of this project and appropriate contracts consummated with the Corps of Engineers for acquisition of the conservation storage in this project. The incremental yield of the Tennessee Colony Reservoir project would satisfy only a part of the ultimate 2030 requirements in the San Jacinto River Basin, however.

Additional sources of water include the Neches and Sabine River Basins in East Texas. Existing reservoirs in those basins could meet anticipated in-basin needs, as well

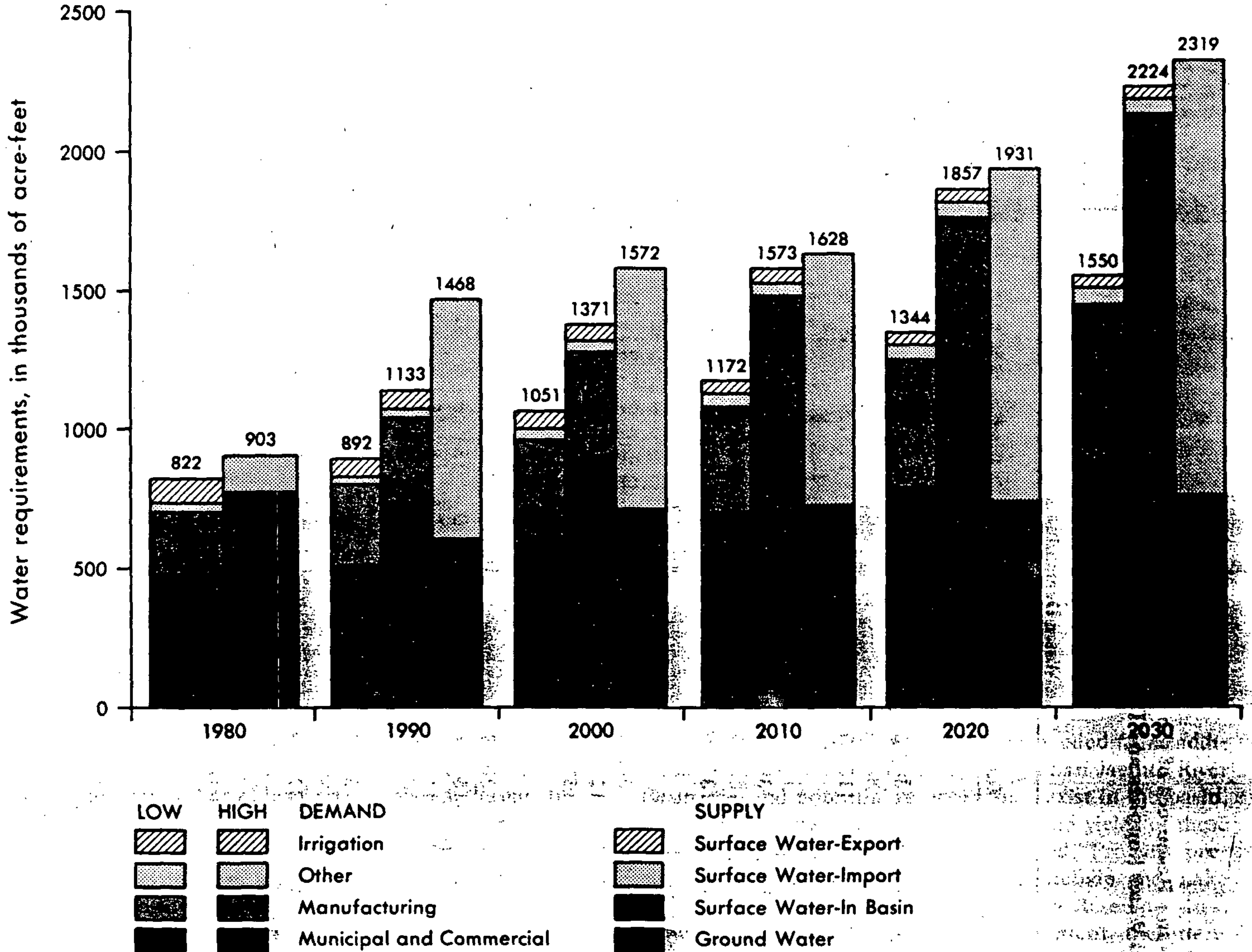


Figure III-10-2. Reported Use and Supply Source, With Projected Water Supplies and Demands, San Jacinto River Basin, 1980-2030

as provide water to the Houston area through the year 2030 if Rockland Reservoir in the Neches River Basin is constructed by the year 2020 and Bon Weir Reservoir is completed in the Sabine by the year 2030. Additional conveyance facilities would be required to move surplus surface waters from the Neches and Sabine River Basins into the San Jacinto River Basin.

The feasibility and costs of conveying supplemental water from the lower Sabine and/or Neches River Basins into the Trinity River Basin, thence into the San Jacinto River Basin, have been given serious study in the past. Additional studies will have to be performed by the Department and regional interests to examine the engineering alternatives and the economic, environmental, and institutional considerations that would be involved in such a major interbasin transfer of water.

Water Quality Protection

A water quality management plan for the San Jacinto River Basin has been developed pursuant to the requirements of the federal and State Clean Water legislation. An areawide water quality management plan has also been developed for the greater Houston metropolitan area. These plans serve as a basic element in the State's overall water quality strategy and provide guidance in establishing priorities for construction grants for waste-treatment facilities, permitting of wastewater facilities, revision of stream standards, and other program activities.

Construction costs associated with municipal wastewater treatment facilities needs have been estimated to be approximately $1,037.2 million for the planning period of 1980 to the year 2000. These costs are estimated for the entire San Jacinto River Basin in January 1980 dollars and are subject to revision as new data become available. The list of projects, with project costs for 1982-1989, at 1980 prices, is shown in Appendix B.

Additional water quality management costs, such as for control of agricultural, oil and gas, and industrial pollutants, cannot be estimated at this time, but are believed to be increasing.

Flood Control Measures

Existing water supply reservoirs in the San Jacinto River Basin have no provisions for flood-control storage. Dams on the Buffalo Bayou watershed, Addicks and Barker, were constructed by the Corps of Engineers in the 1940's for flood-control purposes. They provide a total storage capacity of 411.5 thousand acre-feet. Impounded waters are stored only until releases can be made without damaging property in downstream areas.

To date, flood-control measures implemented in the San Jacinto River Basin have been limited to local entities acting alone and the Corps of Engineers in cooperation with local entities. The Corps of Engineers has three authorized projects in the San Jacinto River Basin. The Buffalo Bayou and tributaries flood-control project has been underway for many years and, if funded, will ultimately result in a comprehensive plan for the control of flooding throughout the watershed. An interim feasibility report has been completed on Sims Bayou and has been forwarded to the Secretary of the Army with a favorable recommendation. There is a separately authorized project for channel improvement of Vince and Little Vince Bayous, which are also tributary to Buffalo Bayou. Construction is underway and is scheduled for completion in December 1986. Planning and engineering studies are underway on Upper White Oak Bayou and tributaries and are scheduled for completion in September 1985.

The authorized San Jacinto River and Tributaries project provides for a flood-control study of the San Jacinto River watershed including consideration of both structural and nonstructural measures. A survey report is due to be completed in September 1989.

The plan for the San Jacinto River Basin provides for coordination of local flood-control and flood-protection measures with planned projects and studies by the Corps of Engineers.

REFERENCE 9

Leo M. Weinberg

SOIL SURVEY OF
Harris County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with the
Texas Agricultural Experiment Station and the
Harris County Flood Control District

Contents

Issued August 1976

of loose, light gray sand that is slightly acid in the upper 25 inches and neutral in the lower 40 inches.

The surface layer of the Kaman soils is about 39 inches thick. It is very firm, neutral, very dark gray clay in the upper part and very firm, mildly alkaline, black clay in the lower part. The layer below that is 13 inches thick and consists of very firm, mildly alkaline, dark gray clay that has slickensides. The next layer, extending to a depth of 70 inches is very firm, mildly alkaline, dark gray clay and has a few yellowish brown mottles and calcium carbonate concretions.

The Hatliff soils are in positions on the landscape similar to those of the Nahatche, Voss, and Kaman soils. Hatliff soils have loamy and sandy layers. The Harris soils are clayey coastal marshland and are subject to inundation by water at high tide. The Ijam soils consist of clayey sediment dredged or pumped from the floor of rivers, bayous, bays, or canals during the construction or maintenance of these waterways.

Most of this association is used for timber production, woodland grazing, pasture, and wildlife habitat. It is not suitable for urban developments.

The soils are subject to flooding and, in some areas where cover is lacking, to soil removal by scouring.

Soil Maps for Detailed Planning

The kinds of soil (mapping units) shown on the detailed soil map at the back of this publication are described in this section. These descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production, in planning land use and developing soil resources, and in enhancing, protecting, and preserving the environment. More information for each soil is given in the section "Planning the Use and Management of the Soils."

Preceding the name of each mapping unit is the symbol that identifies the unit on the detailed soil map. Each mapping unit description includes general facts about the soil and a brief description of the soil profile. The principal hazards and limitations are indicated, and the management concerns and practices for the major uses are discussed.

A mapping unit represents an area on the landscape and consists of a dominant soil or soils for which the unit is named. Most mapping units have one dominant soil, but some have two or more dominant soils. A mapping unit commonly includes small, scattered areas of other soils. The properties of some of these soils can differ substantially from those of the dominant soil and thus greatly influence the use of the dominant soil.

In most areas surveyed there is land that has little or no identifiable soil and supports no vegetation. This land, called miscellaneous land types, is delineated on the map and given descriptive names. Urban land is an example. Areas too small to be delineated are identified by a special symbol on the soil map.

The acreage and proportionate extent of each mapping unit are given in table 2, and additional information on each unit is given in interpretive tables in other sections (see "Summary of Tables"). Many of the terms used in describing soils are defined in the Glossary.

Soil Descriptions

Ad—Addicks loam. This is a nearly level soil in broad areas on the upland prairies. The areas are slightly higher on the landscape than those of the adjacent or surrounding soils. The surface is plane to slightly convex. The slope ranges from 0 to 1 percent but averages about 0.3 percent. Areas of this soil average several hundred acres in size, and some areas are as large as several thousand acres.

The surface layer is friable, neutral, black loam about 11 inches thick. The layer below that is friable, neutral, dark gray loam about 12 inches thick. The next layer is about 26 inches thick and consists of friable, moderately alkaline, light gray loam that is about 20 percent, by volume, visible calcium carbonate. Below that is a layer of firm, moderately alkaline, light gray loam that has distinct yellow and yellowish brown mottles and is about 5 percent visible calcium carbonate.

Included with this soil in mapping are small areas of Clodine, Bernard, Midland, and Gessner soils. Also included are a few areas of a soil that is similar to Addicks loam but is calcareous at the surface. A few areas are recently built-up urban land.

This soil is used primarily for rice, improved pasture, and native pasture. A few small areas are used for corn, grain sorghum, and vegetables. The native vegetation consists of bluestem and panicum and some greenbrier and annual weeds. Improved pasture grasses are common bermudagrass and Coastal bermudagrass. Pine and hardwoods have encroached in some areas.

This soil is poorly drained. It is saturated with water for short periods during the year. Surface runoff is slow, internal drainage is slow; and permeability is moderate. The available water capacity is high.

Drainage is the dominant concern in crop management. Proper fertilization and surface drainage increase crop and pasture production. Capability unit IIIw-1; rice group 2; pasture and hayland group 7C; Loamy Prairie range site; woodland suitability group 2w9; Tight Sandy Loam woodland grazing group.

Ak—Addicks-Urban land complex. This is a nearly level complex in urban areas and in the surrounding rural areas where the population is increasing. Encroachment of trees has occurred in some areas. The older urban areas are generally wooded, as a result of tree planting to provide shade. The areas of this mapping unit are irregular in shape and generally range in size from 30 to 850 acres. A few areas are larger than a thousand acres. The boundaries commonly coincide with the outer limits of subdivisions and other built-up areas. The surface is plane to slightly convex. The slope ranges from 0 to 1 percent and averages about 0.3 percent.

Addicks loam makes up 20 to 85 percent of the complex, Urban land 10 to 60 percent, and other soils 5 to 20 percent. The areas are so intricately mixed that it was not practical to separate them at the mapping scale for this survey.

The Addicks soil has a surface layer of friable, neutral, black loam about 11 inches thick. The layer below that is friable, neutral, dark gray loam about 12 inches thick. The next layer is about 26 inches thick and consists of friable, moderately alkaline, light gray loam that is about 20 percent, by volume, visible calcium carbonate. The layer at a depth of about 49 inches is firm, moderately alkaline, light gray loam that has distinct yellow and yellowish brown mottles and is about 5 percent visible calcium carbonate.

Urban land consists of soils that support buildings and other urban structures that have covered or altered the soils so that classification is not practical. Typical structures are single- and multiple- unit dwellings, streets, schools, churches, parking lots, office buildings, and shopping centers less than 40 acres in size. In places Urban land consists of small areas of Addicks loam that has been altered by cutting, filling, and grading. Fill material has altered the soil in places. In some areas the entire profile is covered with 6 to 24 inches of fill material. Soils in the older areas that are drained by road ditches show less evidence of alteration.

Included with this unit in mapping are a few areas of Clodine, Gessner, Bernard, and Midland soils. These soils are unaltered in places.

This mapping unit has moderate to severe limitations for urban development. Poor drainage is the greatest limitation. There are no limitations for landscaping or for gardening. Chlorosis is common in areas where cuts have been made. Most of the acreage was formerly in cropland or native pasture.

Am—Aldine very fine sandy loam. This is a nearly level soil in broad, oblong and oval, wooded areas. The surface is plane to slightly convex. The slope is 0 to 1 percent, but averages about 0.6 percent. Areas of this soil average 200 acres, but some are several hundred acres in size.

The surface layer is friable, medium acid, dark grayish brown very fine sandy loam about 5 inches thick. The layer below that is friable, medium acid, grayish brown very fine sandy loam about 5 inches thick. It tongues into a layer of friable, very strongly acid, yellowish brown loam about 9 inches thick. The next layer, about 11 inches thick, is firm, very strongly acid, gray clay that has mottles of yellowish brown and red. Below that, extending to a depth of 60 inches, is a layer of firm, slightly acid, light gray clay loam that is less mottled with depth.

Included in some mapped areas of this soil are small areas of Atasco, Bissonnet, Aris, Hockley, Segno, and Ozan soils. These soils make up less than 10 percent of any mapped area. Low, sandy, circular mounds are common in a few places. These rise 6 to 30 inches above the surface and are 15 to 50 feet in diameter.

This Aldine soil is used mainly for timber and woodland. The native vegetation is chiefly pine, hardwoods, sedge, beaked panicum, longleaf uniola, and little bluestem. Some small open or cleared areas are used as pasture or home gardens.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. This soil is saturated at a depth of 20 to 30 inches during cool months and in periods of excessive rainfall.

Cultivated areas of this soil are difficult to manage. Fertilizer, lime, and drainage systems are beneficial to pasture and row crops. Capability unit IIIw-1; rice group 2; pasture and hayland group 8A; woodland suitability group 2w9; Flatwoods woodland grazing group.

An—Aldine-Urban land complex. This is a nearly level to gently sloping complex in metropolitan areas and in rural areas where the population is increasing. This mapping unit is of minor extent. Areas are irregular in shape and generally range from 30 to 250 acres in size. One area, however, covers 1,200 acres. Boundaries commonly coincide with the outer limits of subdivisions and built-up areas. The slope is mainly 0 to 2 percent but ranges to 3 percent. In a few places along drainageways the slope is 5 percent. Native pine and hardwoods are common in most areas.

The Aldine soil makes up 25 to 75 percent of this complex, Urban land 10 to 70 percent, and other soils 5 to 20 percent. The areas are so intricately mixed that it was not feasible to separate them at the mapping scale for this survey.

The surface layer of the Aldine soil is friable, medium acid, dark grayish brown very fine sandy loam about 5 inches thick. The layer below that is friable, medium acid, grayish brown very fine sandy loam about 5 inches thick. It tongues into a layer of friable, very strongly acid, yellowish brown loam about 9 inches thick. The next layer, about 11 inches thick, is firm, very strongly acid, gray clay that has mottles of yellowish brown and red. Below that, extending to a depth of 60 inches, is a layer of firm, slightly acid, light gray clay loam that has less mottles with depth.

Urban land consists of soils that have been altered or obscured by buildings and other urban structures, making their classification impractical. Typical structures are single- multiple-unit dwellings, garages, sidewalks, patios, driveways, streets, schools, churches, shopping centers, office buildings, paved parking lots, and industrial parks. Included with Urban land in mapping are small areas of the Aldine soil that have been altered by cutting, filling, and grading. In places, 6 to 24 inches of fill material has been added to improve drainage.

Included with this unit in mapping are a few areas of Atasco, Bissonnet, Aris, Hockley, Segno, Vamont, and Ozan soils. These soils are unaltered in places.

This mapping unit has moderate to severe limitations for urban development. It has severe limitations for use as septic tank filter fields because the clayey subsoil is drainage and permeability are rapid above the layer that has plinthite. Below that, permeability is moderately slow. The available water capacity is low. Capability unit IIIw-3; pasture and hayland group 9C; woodland suitability group 2s2; Sandy woodland grazing group.

Cd—Clodine loam. This is a nearly level soil on broad, irregular areas, about 400 acres in size, that are generally low on the landscape. Slopes are 0 to 1 percent but average 0.5 percent.

The surface layer is friable, dark gray loam about 12 inches thick. It is neutral in the upper part and moderately alkaline in the lower part. The layer below that is friable, moderately alkaline, gray loam about 17 inches thick. The next layer extends to a depth of 72 inches. It is friable, moderately alkaline, light brownish gray loam that has irregular, pitted calcium carbonate concretions.

Included with this soil in mapping are small areas of Addicks, Aris, Gessner, Midland, Edna, and Katy soils and small areas of saline soils. In some undisturbed areas there are low, circular, sandy mounds about 30 to 40 feet in diameter. These inclusions make up less than 15 percent of any mapped area.

This soil is used mainly for growing native pasture for cattle and for rice. Native grasses are mainly prairie grasses, such as andropogon, paspalum, and panicum. Myrtle bushes are common. Pine and oak forests have encroached in some areas.

This soil is poorly drained and is saturated for 3 to 6 months in winter and early in spring. Surface runoff is very slow, and internal drainage is slow. Permeability is moderate. The available water capacity is high.

Excess water on the surface makes this soil cold, often reducing stands of early crops. Drainage, fertilization, and crop residue are essential in maintaining the high productivity of this soil. Capability unit IIIw-1; rice group 2; pasture and hayland group 8E; Lowland range site; woodland suitability group 2w9; Flatwoods woodland grazing group.

Ce—Clodine-Urban land complex. This is a nearly level complex in broad, irregular areas that range from 20 to several hundred acres in size. The slope ranges from 0 to 1 percent but averages 0.6 percent. Pine and hardwoods have encroached in some areas, and in a few areas trees have been planted for shade.

Clodine soils make up 20 to 85 percent of this mapping unit; Urban land, 10 to 75 percent; and other soils, 5 to 20 percent. The soils are so intricately mixed that separation was not practical at the scale used in mapping.

The surface layer of the Clodine soil is friable, dark gray loam about 12 inches thick. It is neutral in the upper part and moderately alkaline in the lower part. The layer below that is friable, moderately alkaline, gray loam about 17 inches thick. The next layer is friable, moderately alkaline, light brownish gray loam that has irregular, pitted calcium carbonate concretions.

Urban land consists of soils that have been altered or covered by buildings and other urban structures making classification impractical. Typical structures are single- and multiple-unit dwellings, driveways, sidewalks, garages and patios, streets, schools, churches, parking lots, office buildings, and shopping centers of less than 40 acres in size. Included are areas of Clodine soils that have been altered by cutting, filling, and grading for development. Fill material commonly covers the Clodine soils.

This mapping unit has moderate to severe limitations for urban development. The main limitation is poor drainage. There are only a few limitations for landscaping and gardening, but chlorosis in plants is common.

Ed—Edna fine sandy loam. This is a nearly level soil on the prairie. The areas of this soil are irregular and generally small, but a few are several hundred acres in size. The slope is mainly 0 to 2 percent but averages 0.8 percent. In some undisturbed areas, the surface is covered with small circular pimple mounds. The mounds generally are leveled if the soil is cultivated.

The surface layer is friable, neutral, dark grayish brown fine sandy loam about 5 inches thick. It abruptly meets the layer below that, which is very firm, moderately alkaline clay about 36 inches thick. The clay is gray in the upper part and olive gray in the lower part. The next layer extends to a depth of 72 inches; it is firm, moderately alkaline, gray sandy clay loam that has mottles of yellowish brown.

Included with this soil in mapping are small areas of Addicks, Aris, Bernard, Clodine, Gessner, Katy, and Midland soils, which make up less than 15 percent of any mapped area. Also included are soils, mainly in areas of pimple mounds, that are similar to this Edna soil but that have a surface layer 10 to 18 inches thick.

This soil is used mainly for rice and native pasture. A few small areas are used for corn or grain sorghum. Native vegetation is mainly such prairie grasses as paspalum, panicum, and sporobolus.

This soil is poorly drained. Runoff and permeability are very slow. The soil is saturated for long periods in winter and early spring. The available water capacity is high.

Poor surface drainage and the droughtiness of the clayey subsoil are the main limitations. Fertilization and drainage are beneficial in crop and pasture production. Capability unit IIIw-1; rice group 2; pasture and hayland group 8A; Claypan Prairie range site; woodland suitability group 2w9; Tight Sandy Loam woodland grazing group.

Ge—Gessner loam. This is a nearly level soil in broad, irregular areas and in small, round depressions. It is lower on the landscape than adjacent soils. In places this soil is wet or ponded for long periods after heavy rains. Most of the water evaporates. Slopes are mainly less than 0.5 percent, but the range is 0 to 1 percent. The surface is plane to slightly concave. Mapped areas average 170 acres, but some are several hundred acres in size.

The surface layer is friable, slightly acid, dark grayish brown loam about 7 inches thick. The layer below that is about 9 inches thick and is friable, slightly acid, grayish brown loam. It tongues into the next layer, which is friable, neutral, dark gray loam, about 18 inches thick, that is slightly more clayey. The layer below that is about 19 inches thick and consists of friable, moderately alkaline, light brownish gray loam. The next layer, to a depth of 84 inches, is firm, moderately alkaline, light gray sandy clay loam that has distinct mottles of yellowish brown and brownish yellow.

Included with this soil in mapping are small areas of Addicks, Aris, Clodine, Katy, Ozan, and Wockley soils, which make up less than 15 percent of any mapped area.

This soil is used mainly for native pasture, improved pasture, and rice. Native vegetation is chiefly low panicum and paspalum, carpetgrass, berryvines, rushes, sedges, and weeds. Improved pasture grasses are chiefly common bermudagrass, Coastal bermudagrass, and Pensacola bahiagrass. In timbered areas, the vegetation is mainly water oak, willow oak, ash, ironwood, hickory, loblolly pine, palmetto, greenbrier, and longleaf uniola.

This soil is poorly drained and is generally saturated in wet periods. Surface runoff is very slow to ponded, and internal drainage is slow. Permeability is moderate, and the available water capacity is high.

Excess water on the surface and inadequate drainage are the major limitations. Fertilization, liming, and drainage are needed for pasture and row crops. Capability unit IVw-l; rice group 2; pasture and hayland group 8E; Lowland range site; woodland suitability group 3w9; Flatwoods woodland grazing group.

Gs—Gessner complex. This is a nearly level complex in broad, irregular areas that are about 400 acres in size. The slope is 0 to 1 percent. Pimple mounds and slight depressions between the mounds are characteristic of the areas.

Gessner soils make up 55 to 70 percent of this complex; Clodine soils, 15 to 20 percent; and other soils,15 to 25 percent. The Gessner soils, and some Addicks soils, are on the flats and in the depressions between the mounds. Clodine soils are in the nearly level areas surrounding the mounds. The other soils, mainly Wockley, Katy, and Aris soils, generally are on the pimple mounds.

The surface layer of the Gessner soils is friable, slightly acid, dark grayish brown loam about 7 inches thick. The layer below that is about 9 inches thick and consists of friable, slightly acid, grayish brown loam. It tongues into the next layer, which is friable, neutral, dark gray loam, about 18 inches thick, that is slightly more clayey. The layer below that is about 19 inches thick and consists of friable, moderately alkaline, light brownish gray loam. The next layer, to a depth of 84 inches, is firm, moderately alkaline, light gray sandy clay loam that has distinct mottles of yellowish brown and brownish yellow.

This complex is used mainly for native pasture of beaked panicum, little bluestem, and Indiangrass. Land leveling is needed where the soils are used for rice. Pine and hardwoods have encroached in some areas.

This complex is poorly drained and is generally saturated in winter and early in spring. Surface runoff is very slow, and internal drainage is slow. Permeability is moderate. The available water capacity is high.

Excess water on the surface is the major limitation. Drainage, fertilization, and land leveling are needed for crops. Capability unit IVw-1; rice group 2; pasture and hayland group 8E; Lowland range site; woodland suitability group 3w9; Flatwoods woodland grazing group.

Gu—Gessner-Urban land complex. This mapping unit is in broad, nearly level areas and in depressions. It consists of built-up areas and areas where the population is increasing. The areas range from 15 to 180 acres, but a few are several hundred acres in size. Slopes are mainly 0 to 1 percent. Water stands on the surface in the depressions for long periods after rains. There are pimple mounds in a few areas. These are leveled in urban development. Water oak, willow oak, hackberry, sweetgum, and elm have encroached in some areas.

Gessner soils make up 20 to 80 percent of this unit; Urban land, 10 to 75 percent; and other soils, 10 to 20 percent. The areas making up this complex are so intricately mixed that separation was not practical at the scale use in mapping.

The surface layer of the Gessner soils is friable, slightly acid, dark grayish brown loam about 7 inches thick. The layer below that is about 9 inches thick and consists of friable, slightly acid, grayish brown loam. It tongues into the next layer, which is friable, neutral, dark gray loam, about 18 inches thick that is slightly more clayey. The layer below that is about 19 inches thick and consists of friable, moderately alkaline, light brownish gray loam. The next layer, to a depth of 84 inches, is firm, moderately alkaline, light gray sandy clay loam that has distinct mottles of yellowish brown and brownish yellow.

Urban land consists of soils that have been altered or covered by buildings or other urban structures and of other disturbed areas. Classifying these soils is not practical. Typical structures are single- and multiple-unit dwellings, garages, sidewalks, patios, driveways, streets, schools, churches, shopping centers, office buildings, pipe yards, refineries, chemical plants, railroads and paved parking lots. Other areas have been disturbed by cutting, filling, or grading. In some areas 6 to 24 inches of fill material covers the entire soil profile.

Included with this complex in mapping are mainly Addicks, Clodine, Katy, Aris, and Wockley soils.

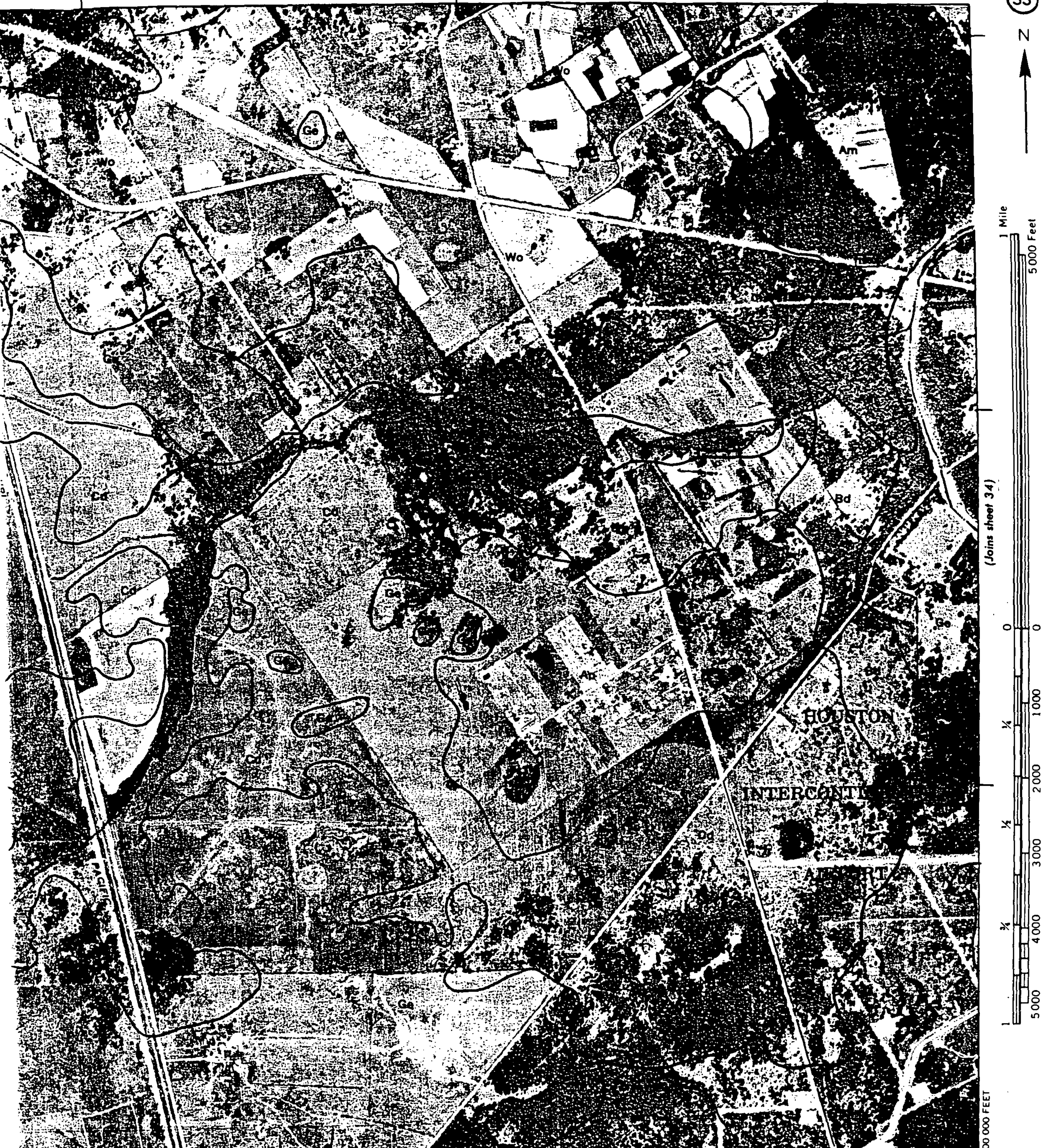
Gessner soils have severe limitations for streets and low-cost roads and urban development in general and for use as septic tank filter fields. The main limitation is poor drainage. Water stands on the surface for long periods after rains, and the soil remains wet long after water on the surface has evaporated. The risk of corrosion to uncoated steel is high. Most areas are muddy and boggy when wet.

Ha—Harris clay. This is a level to nearly level soil on coastal marshlands. It is generally lowest on the landscape and in most areas is subject to inundation by high tide. The areas are oblong and crescent shaped and average about 35 acres in size. Slopes average 0.1 percent but range from 0 to 1 percent.

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Data from Houston, elevation 96 feet. Period of record 1931-70]

Month	Temperature				Precipitation											
	Mean daily maximum	Mean monthly maximum	Mean daily minimum	Mean monthly minimum	Mean total	Probability of receiving--								Mean number of days with--		
						0 or trace	.5 inch or more	1 inch or more	2 inches or more	3 inches or more	4 inches or more	5 inches or more	6 inches or more	.1 inch or more	.5 inch or more	1 inch or more
	F	F	F	F	In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct			
January---	63.6	78.6	43.6	25.0	3.78	<1	97	92	74	54	35	24	14	5	2	1
February--	65.5	79.8	46.0	30.1	3.44	<1	96	90	70	49	30	19	14	5	2	1
March-----	71.7	84.4	50.8	34.1	2.67	<1	93	80	58	38	25	18	10	4	1	1
April-----	78.0	88.0	59.0	45.5	3.24	<1	96	90	70	50	35	20	14	4	2	1
May-------	85.7	91.9	66.2	55.6	4.32	<1	93	85	73	55	43	33	22	5	3	2
June------	91.1	96.2	72.0	65.0	3.69	<1	93	82	63	45	34	25	16	5	3	2
July------	92.1	98.0	73.8	70.2	4.29	<1	96	90	75	55	40	30	25	5	2	1
August----	92.8	98.7	73.6	68.7	4.27	<1	95	85	70	50	40	30	20	6	3	2
September-	89.1	95.7	69.3	59.2	4.26	<1	95	86	70	55	40	30	25	6	3	1
October---	82.3	91.3	60.4	46.1	3.77	3	85	85	55	40	30	20	11	5	2	1
November--	71.1	84.9	50.5	34.1	3.86	<1	94	83	65	50	33	23	20	5	2	1
December--	64.5	79.8	45.9	28.7	4.36	<1	99	95	80	60	50	33	24	6	3	1
Year----	79.0	88.9	59.3	46.9	45.95	--	--	--	--	--	--	--	--	61	28	15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N
Ge
Wo
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HOUSTON
Dd
Ge
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1 Mile
5000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
Scale 1:20000
800 000 FEET
(Joins sheet 45)
3 150 000 FEET

REFERENCE 10 - Not Used

REFERENCE 11 - Not Used

REFERENCE 12 - Not Used

REFERENCE 13

CITY OF HOUSTON

(A PUBLIC WATER SUPPLY PROTECTION STRATEGY)

Brad L. Cross
Geologist
Texas Water Commission

David P. Terry, M.En.
Environmental Scientist
Texas Water Commission

and

Valerie R. Billings, P.E.
Texas Department of Health

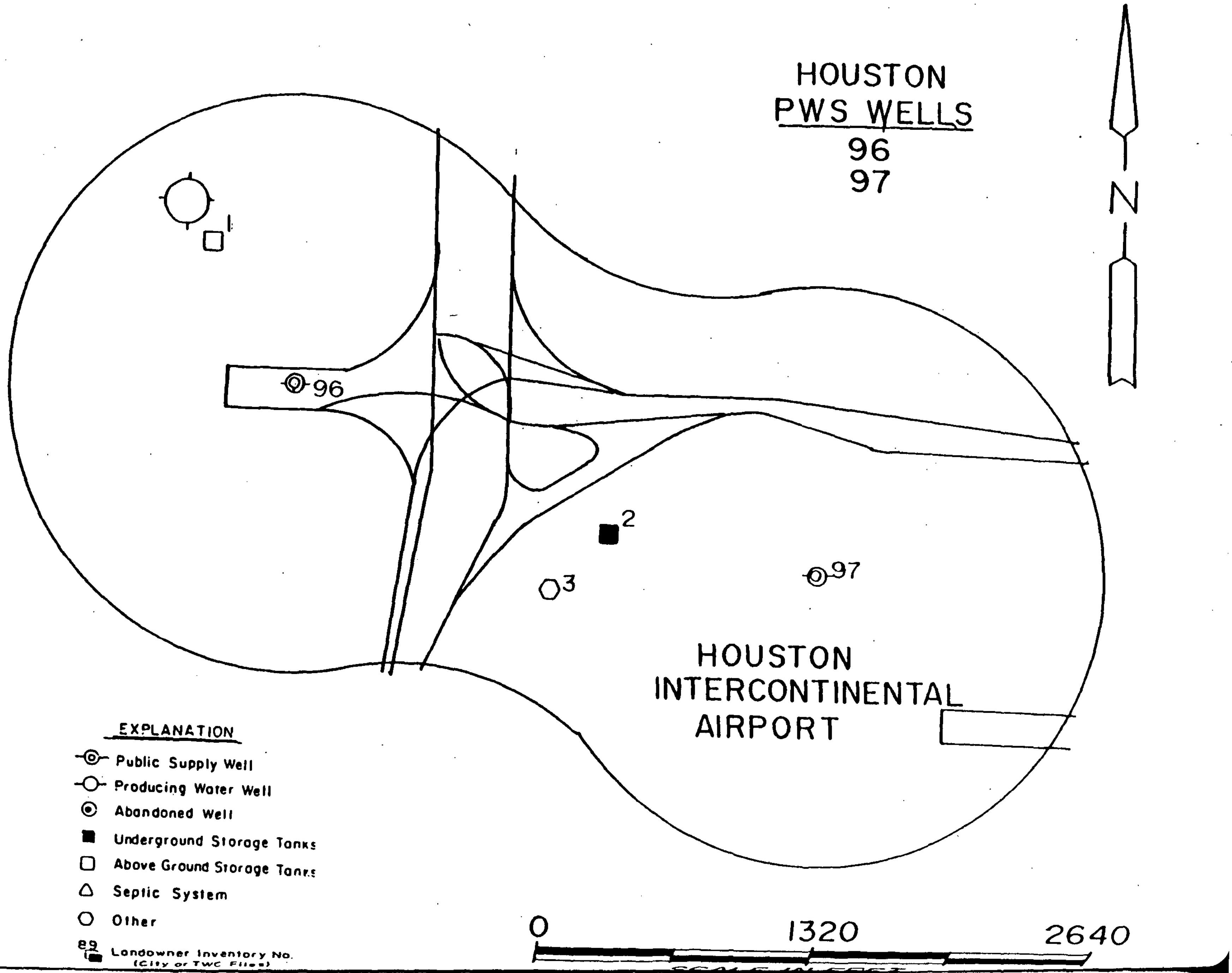
July 1991

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

APPENDICES

TABLES AND FIGURES


HOUSTON
PWS WELLS
96
97
N
1
96
2
3
97
HOUSTON
INTERCONTINENTAL
AIRPORT
EXPLANATION
Public Supply Well
Producing Water Well
Abandoned Well
Underground Storage Tanks
Above Ground Storage Tanks
Septic System
Other
89
Landowner Inventory No.
(City or TWC Files)
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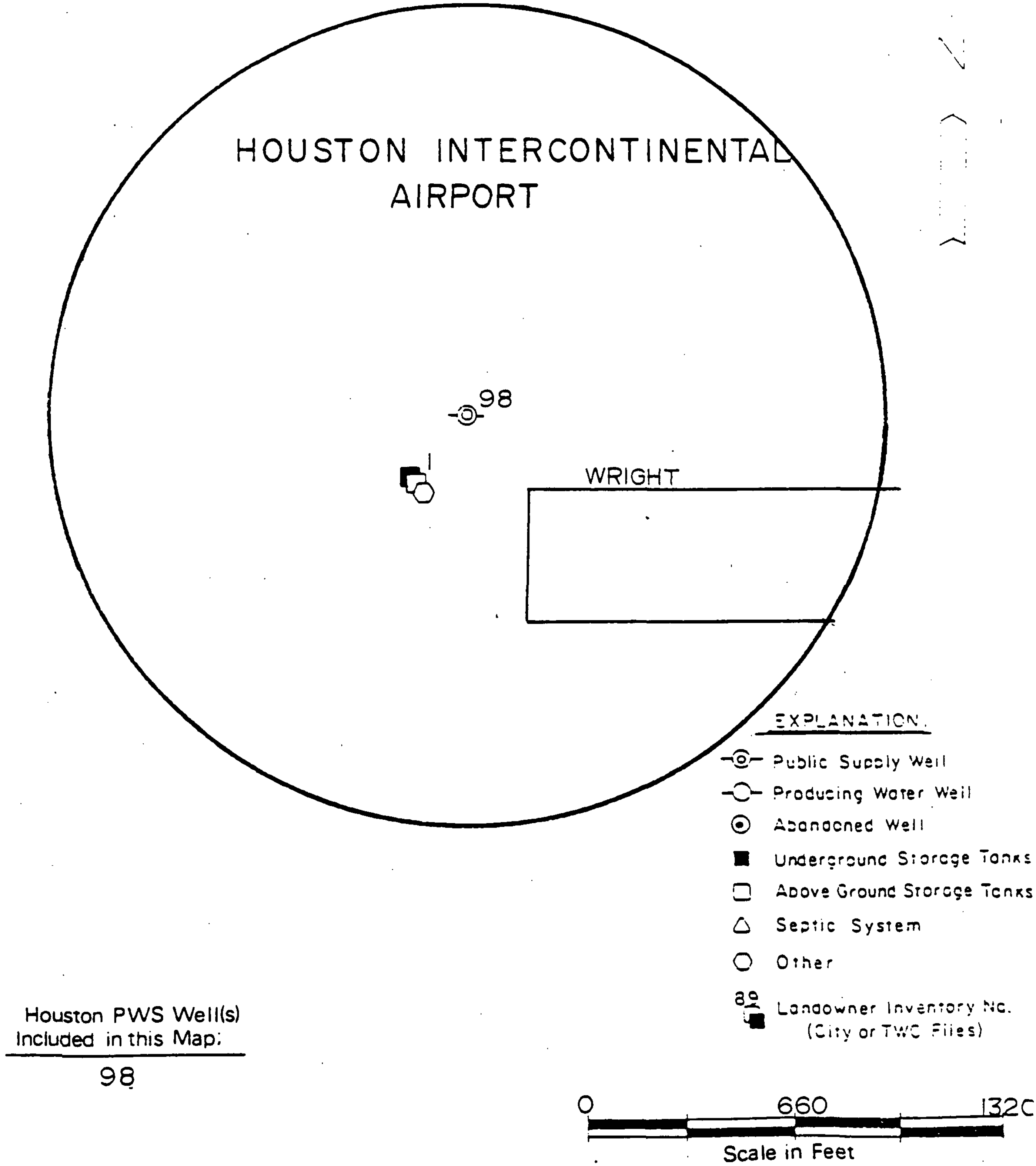
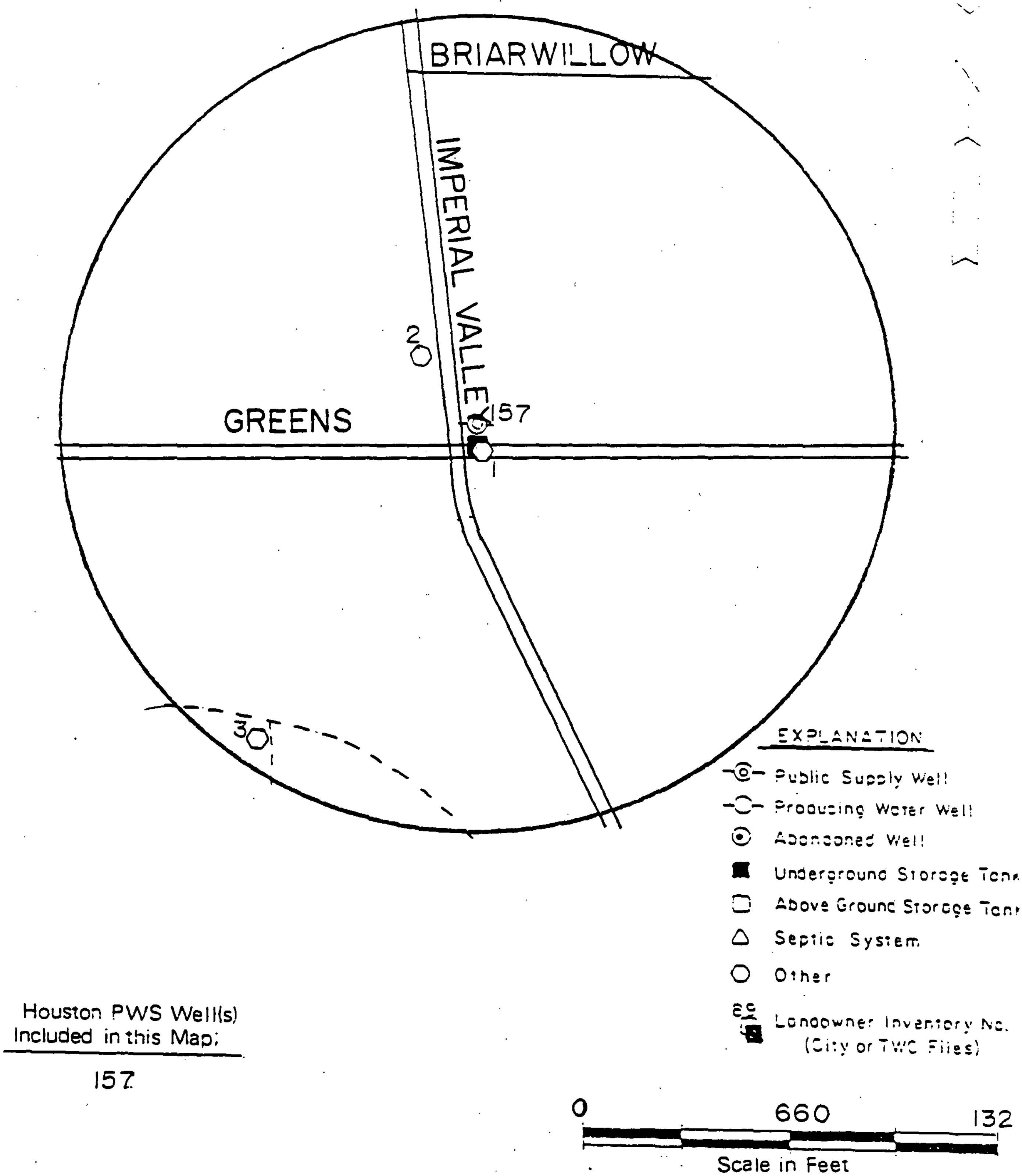
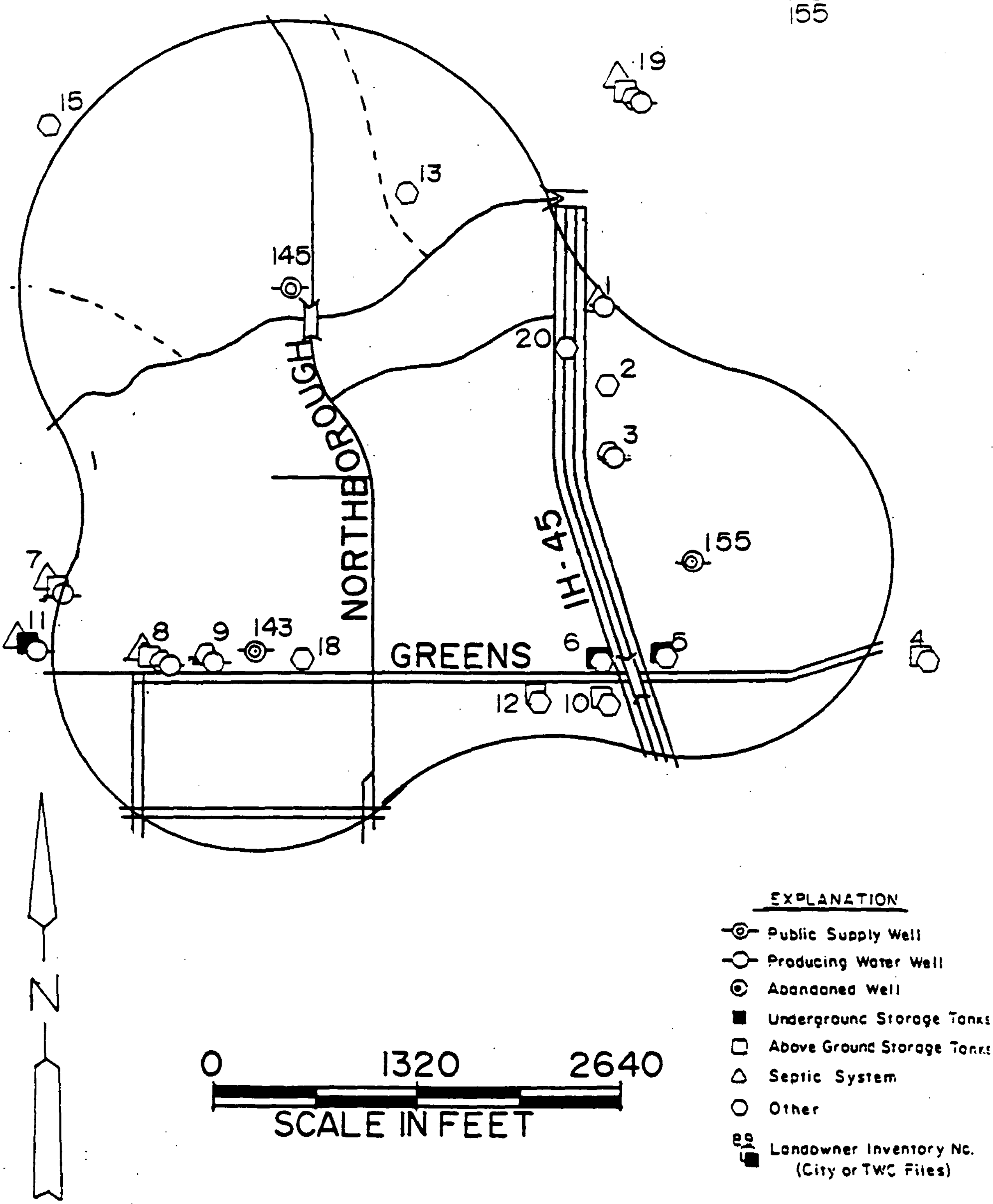
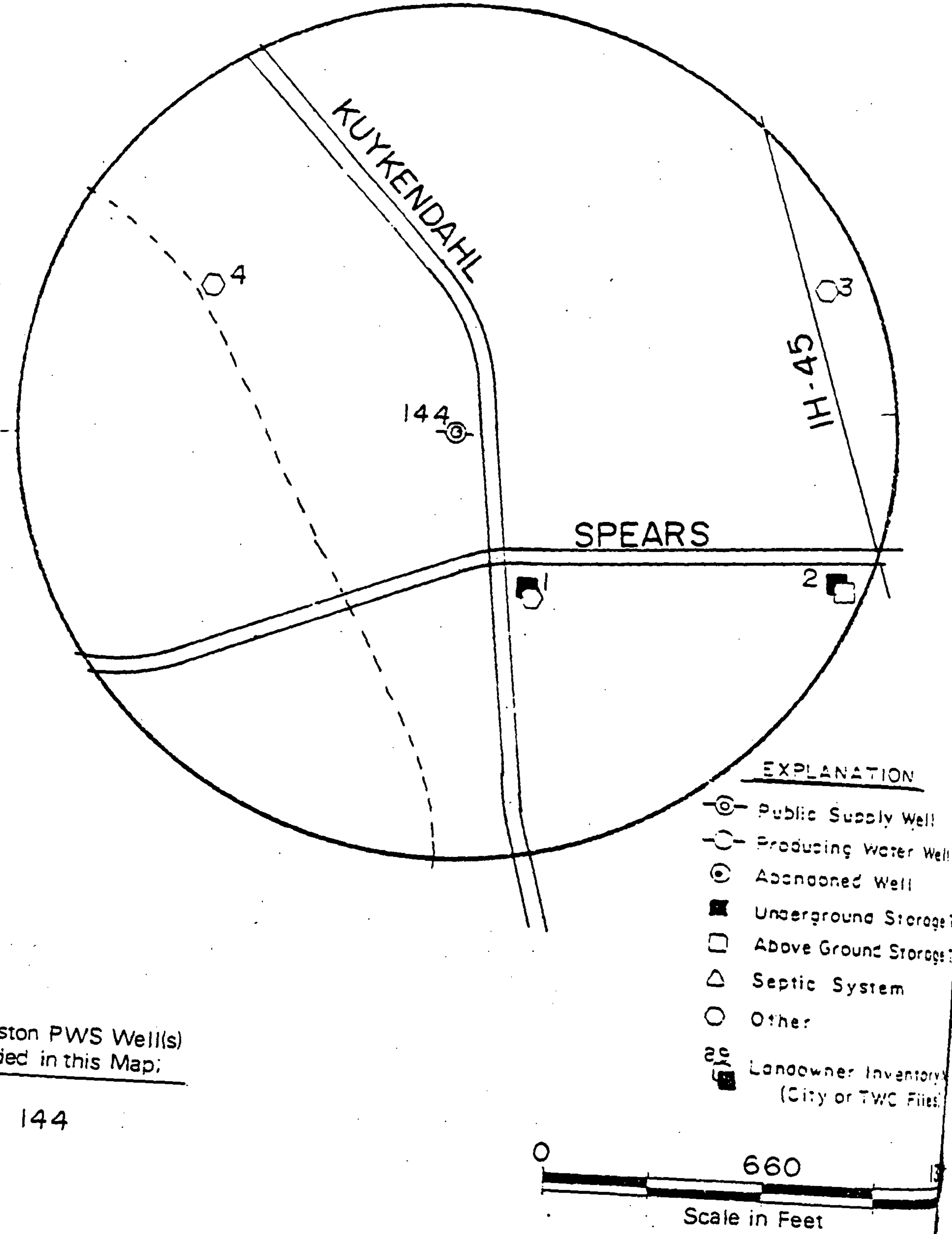
1320
2640


HOUSTON INTERCONTINENTAL AIRPORT
98
1
WRIGHT
EXPLANATION
Public Supply Well
Producing Water Well
Abandoned Well
Underground Storage Tanks
Above Ground Storage Tanks
Septic System
Other
89
Landowner Inventory No. (City or TWC Files)
Houston PWS Well(s) Included in this Map:
98
0
660
1320
Scale in Feet


BRIARWILLOW
IMPERIAL VALLEY
GREENS
157
2
3
1
EXPLANATION
Public Supply Well
Producing Water Well
Abandoned Well
Underground Storage Tank
Above Ground Storage Tank
Septic System
Other
Landowner Inventory No. (City or TWC Files)
Houston PWS Well(s) Included in this Map:
157
0
660
132
Scale in Feet

HOUSTON
PWS WELLS
143
145
155





Houston PWS Well(s) Included in this Map:

144

REFERENCE 14

From:
Humble 7.5min 1982
Aldine 7.5min 1982
Spring 7.5 1982
Moderm 7.5 1982
*. There is one more well within 4 miles located directly north of 0911 at 1.25 miles. Well name is 0604
832
911
907
831
1960
College
109
214
207
604
202
102
103
309
301
Rankin Road
57'30"
414
510
515
516
506
619
405
512
502
616
615
618

TEXAS DEPARTMENT OF WATER RESOURCES

WELL SCHEDULE

Aquifer(s)________ Project No.________ State Well No. 60-62-907

________ Field No./Owner's Well No.________ County Harris

1. Location: ___¼, ___¼, Section____, Block____, Survey________, Lat.________, Long.________

2. Owner: Harris County WCID Address: Houston Texas

   Tenant (other):________ Address:________

   Driller: Layne Western Co. Address: Houston Texas

3. Land Surface Elevation: 70 ft. above msl determined by________

4. Drilled:________ 1978; Dug, Cable Tool, Rotary, Air, ____

5. Depth: Rept. 538 ft. Meas.________ft.

6. Borehole Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed

7. Pump: Mfr.________ Type Turbine

   No. Stages____, Bowls Diam.____in., Setting________ft.

   Column Diam.________in., Length Tailpipe________ft.

8. Motor: Mfr.________ Fuel Elec HP.____

9. Yield: Flow____gpm, Pump____gpm, Meas., Rept., Est.____ Date____

10. Performance Test: Date____ Length of Test____ Made by________

    Static Level____ft. Pumping Level____ft. Drawdown____ft.

    Production________gpm Specific Capacity________gpm/ft.

11. Quality: (Remarks on taste, odor, color, etc.)________

    Analyses

    Date________ Laboratory________ TDS____ Sp Cond____

    Date________ Laboratory________ TDS____ Sp Cond____

12. Other data available (as circled): Pumping Test, Power & Yield Test, Drillers Log, Formation Samples, Geophysical Log(s)________ (type)

13. Water Level(s): 104 ft. rept. meas. June 1978 above below ________ which is____ft. above below Land Surface

    ________ft. rept. meas.________ 19__ above below ________ which is____ft. above below Land Surface

14. Use: Dom., Stock, Public Supply, Ind., Irr., Observation, Other (Test Hole, Oil Test, etc.)________

15. Recorded by:________ Source of data:________ Date:________

16. Remarks:________

17. Location or Sketch:

CASING, BLANK PIPE & WELL SCREEN Cemented From____ft. to____ft.			
Diam. (in.)	Type	Setting (feet) from	to
10	Steel	0	396
6		396	538

W/L Obs. Well W/Q Obs. Well

State Well No. 6062-907

WR-0308

Type of water?________ depth of strata________

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true...

WRD Exp. (GW)
April 1966

Well No. LJ-60-61-102

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by D. BUTLER Source of data D. RECORD Date 11-23-76 Map 1:24000 Spring Tex 1960

State TEXAS [4 8] County (or town) HARRIS [L J]

Latitude: [3 0 0 6 0 8 N] deg min sec N/S Longitude: [0 9 5 2 9 4 2] degrees min sec Sequential number: [1]

Lat-long accuracy: [ ] T ____ N/S, R ____ E/W, Sec ____, ¼, ¼, ¼ B & M

Local well number: [LJ-60-61-102] Other number: ____

Local use: [ ] Owner or name: EN CANTO REAL U.D.

Owner or name: [EN CANTO REAL] Address: COTTONWOOD ROAD FOX HOLLOW ADDITION

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist [W]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other [P]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. [W]

DATA AVAILABLE: Well data [ ] Freq. W/L meas.: ____ [O] Field aquifer char. [ ]

Hyd. lab. data: ____ [ ]

Qual. water data; type: 11-9-73 [ ]

Freq. sampling: LAYNE TEXAS CO [O] Pumpage inventory: yes no, period: ____ [ ]

Aperture cards: ____ yes [ ]

Log data: D-Log 0-1309' E-log F-26 [D E]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 585 ft [585] Meas. rep. accuracy [3]

Depth cased (first perf.) 370 ft [370] Casing type: steel ; Diam. 18-12¾-10¾ [1 8]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other [G]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [H]

Date Drilled: 10-8-73 [9 7 3] Pump intake setting: 280 ft [280]

Driller: LAYNE TEXAS Co. (name), HOUSTON, TEXAS (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other [T] Deep / Shallow [ ]

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. ____ [5] Trans. or meter no. ____

Descrip. MP ____ ft above/below LSD, Alt. MP ____

Alt. LSD: 131 [131] Accuracy (source) 5' Topo [3]

Water Level 112 ft above/below MP; Ft above/below LSD [112] Accuracy; Rept [G]

Date meas. 11-9-73 [N 73] Yield: 805 gpm [805] Method determined [ ]

Drawdown: 84 ft [84] Accuracy: Rept. [ ] Pumping period 24 hrs [24]

QUALITY OF WATER DATA: Iron .05 ppm [0] Sulfate 10 ppm [0] Chloride 40 ppm [2] Hard. 150 ppm [4]

Sp. Conduct 450 K x 10^6 [3] Temp. ____ °F [ ] Date sampled [ ]

Well No.

Well No. LJ-60-61-102

Latitude-longitude
N
S
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD

Physiographic Province: COASTAL PLAIN | 0 | 3 | Section:

F | Drainage Basin: | 5 | 1 | 0 | Subbasin:

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat | C

MAJOR AQUIFER: system, series | Evangeline aquifer, formation, group | E

Lithology: | Origin: | Aquifer Thickness: ft

Length of well open to: 130 ft | 1 | 3 | 0 | Depth to top of: ft

MINOR AQUIFER: system, series | aquifer, formation, group

Lithology: | Origin: | Aquifer Thickness: ft

Length of well open to: ft | Depth to top of: ft

Intervals Screened: 370-450', 520-570' SSWW Barlug

Depth to consolidated rock: ft | Source of data:

Depth to basement: ft | Source of data:

Surficial material: | Infiltration characteristics:

Coefficient Trans: gpd/ft | Coefficient Storage:

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards:

239-427

Cemented to 360'

18" OD to 290'

12 3/4" OD to 368'

10 3/4" OD to 585'

Fenced with pressure tank only.
Gate locked.

Test well depth = 1309'
Completed depth = 585'

Well No.

GPO 857-700

REFERENCE 15

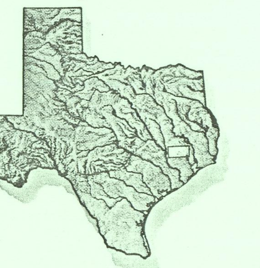
CONROE, TEXAS

30 X 60 MINUTE SERIES (TOPOGRAPHIC)

Conroe

TEXAS

1:100 000-scale *metric* topographic map



30 X 60 MINUTE QUADRANGLE SHOWING

- Contours and elevations in meters
- Highways, roads and other manmade structures
- Water features
- Woodland areas
- Geographic names

U.S. DEPARTMENT OF THE INTERIOR March 3, 1849 GEOLOGICAL SURVEY

1985

Produced by the United States Geological Survey

Compiled from USGS 1:24 000-scale topographic maps dated 1961–1982. Planimetry revised from aerial photographs taken 1982–1983 and other source data. Revised information not field checked. Map edited 1985

1927 North American Datum (NAD 27). Projection and 10 000-meter-grid: Universal Transverse Mercator, zone 15 25 000-foot ticks: *Texas coordinate system* central and south central zones

The difference between NAD 27 and North American Datum of 1983 (NAD 83) is too small to show at this scale. The values of the shift between the datums for 7.5-minute intersections are given in USGS Bulletin 1875

There may be private inholdings within the boundaries of the National or State reservations shown on this map

CONTOUR INTERVAL 10 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ELEVATIONS SHOWN TO THE NEAREST METER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

CONVERSION TABLE

Meters	Feet
1	3.2808
2	6.5617
3	9.8425
4	13.1234
5	16.4042
6	19.6850
7	22.9659
8	26.2467
9	29.5276
10	32.8084

To convert meters to feet multiply by 3.2808

To convert feet to meters multiply by 0.3048

DECLINATION DIAGRAM

GN MN
1°16′ 23 MILS
6° 107 MILS

UTM grid convergence (GN) and 1985 magnetic declination (MN) at center of map
Diagram is approximate

ADJOINING MAPS

1	2	3
4		5
6	7	8

1 Bryan
2 Huntsville
3 Livingston
4 Brenham
5 Beaumont
6 Eagle Lake
7 Houston
8 Anahuac

FOR SALE BY U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

Topographic Map Symbols

Primary highway, hard surface
Secondary highway, hard surface
Light duty road, principal street, hard or improved surface
Other road or street; trail
Route marker: Interstate; U. S.; State
Railroad: standard gage; narrow gage
Bridge; overpass; underpass
Tunnel: road; railroad
Built up area; locality; elevation
Airport; landing field; landing strip
National boundary
State boundary
County boundary
National or State reservation boundary
Land grant boundary
U. S. public lands survey: range, township; section
Range, township; section line: protracted
Power transmission line; pipeline
Dam; dam with lock
Cemetery; building
Windmill; water well; spring
Mine shaft; adit or cave; mine, quarry; gravel pit
Campground; picnic area; U. S. location monument
Ruins; cliff dwelling
Distorted surface: strip mine, lava; sand
Contours: index; intermediate; supplementary
Bathymetric contours: index; intermediate
Stream, lake: perennial; intermittent
Rapids, large and small; falls, large and small
Area to be submerged; marsh, swamp
Land subject to controlled inundation; woodland
Scrub; mangrove
Orchard; vineyard

A pamphlet describing topographic maps is available on request

SCALE 1:100 000
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
CONTOUR INTERVAL 10 METERS

CONROE, TEXAS
30095-A1-TM-100
1985

HOUSTON, TEXAS

30X60 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:100 000

1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND

CONTOUR INTERVAL 5 METERS

SUPPLEMENTARY CONTOUR INTERVAL 2.5 METERS

KILOMETERS 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

MILES 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13

1000 0 5000 10 000 15 000 20 000 METERS

5000 0 10 000 20 000 30 000 40 000 50 000 60 000 70 000 FEET

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1992

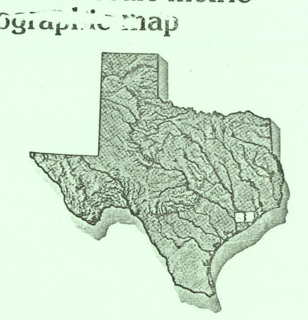
HOUSTON, TEXAS
29095-E1-TM-100
1992

29095-E1-TM-100

Houston

TEXAS

1:100 000-scale *metric* topographic map



30 X 60 MINUTE QUADRANGLE SHOWING

- Contours and elevations in meters
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- Geographic names

GEOLOGICAL SURVEY

1992

Produced by the United States Geological Survey

Compiled from USGS 1:24 000-scale topographic maps dated 1970–1982. Planimetry revised from aerial photographs taken 1989–1990 and other source data Revised information not field checked. *Map edited 1992*

1927 North American Datum (NAD 27). Projection and 10 000-meter-grid: Universal Transverse Mercator, zone 15 25 000-foot grid ticks: Texas coordinate system south central zone

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CONTOUR INTERVAL 5 METERS
SUPPLEMENTARY CONTOUR INTERVAL 2.5 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ELEVATIONS SHOWN TO THE NEAREST METER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

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To convert feet to meters multiply by 0.3048

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1°14' 22 MILS
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UTM grid convergence (GN) and 1992 magnetic declination (MN) at center of map Diagram is approximate

ADJOINING MAPS

1	2	3
4		5
6	7	8

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2 Conroe
3 Beaumont
4 Eagle Lake
5 Anahuac
6 El Campo
7 Angleton
8 Galveston

FOR SALE BY U.S. GEOLOGICAL SURVEY
DENVER, COLORADO, 80225, OR RESTON, VIRGINA 22092

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Area to be submerged; marsh, swamp
Land subject to controlled inundation; woodland
Scrub; mangrove
Orchard; vineyard

A pamphlet describing topographic maps is available on request

REFERENCE 16

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding; velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X	Areas determined to be outside 500-year floodplain.
ZONE D	Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

	Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
513	Base Flood Elevation Line; Elevation in Feet*
D — D	Cross Section Line
(EL 987)	Base Flood Elevation in Feet Where Uniform Within Zone*
RM7 X	Elevation Reference Mark
•M1.5	River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for possible updated flood hazard information prior to use of this map for property purchase or construction purposes.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Areas of special flood hazard (100-year flood) include Zones A, AE, AH, AO, A99, V, and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Elevation reference marks are described in the Flood Insurance Study Report.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
SEPTEMBER 28, 1990

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

Refer to the Flood Insurance Rate Map Effective date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

HARRIS COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 100 OF 390

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HOUSTON, CITY OF	480296	0100	G
UNINCORPORATED AREAS	480287	0100	G

MAP NUMBER
48201C0100 G

EFFECTIVE DATE:
SEPTEMBER 28, 1990

Federal Emergency Management Agency

REFERENCE 17 - Not Used

REFERENCE 18 - Not Used

REFERENCE 19

WESTON MANAGERS DESIGNERS/CONSULTANTS

K. DORSEY
Originator

PHONE CONVERSATION RECORD

Conversation with:

Name DIANNA FOSS

Company TX PARKS + WILDLIFE DEPT

Address SHELDON LAKE STATE PARK

Phone (713) 456-9350

Date 1 / 10 / 96

Time 10:45 AM PM

☑ Originator Placed Call

☐ Originator Received Call

W.O. NO. 04603-022-025/028

Subject FISHING IN HOUSTON AREA

Notes: MS. FOSS STATED THAT FISHING WAS PERMITTED IN LAKE HOUSTON, THE SAN JACINTO RIVER AND ANY OF THE BAYOUS OR PERENNIAL STREAMS IN THE HOUSTON AREA.

☐ **File** ________

☐ **Tickle File** ____/____/____

☐ **Follow-Up By:** ________

☐ **Copy/Route To:** ________

Follow-Up-Action: ________

Originator's Initials ________

RFW 110-4-83

REFERENCE 20

AIRPORT HOLDING A

COVERAGE

STATE	COUNTY	STATE NAME	COUNTY NAME
48	201	Texas	Harris Co
48	339	Texas	Montgomery Co

CENTER POINT AT STATE : 48 Texas
COUNTY : 201 Harris Co

Press RETURN key to continue...

REGION OF THE COUNTRY

Zipcode found: 77073 at a distance of 2.7 Km

STATE	CITY NAME	COMMUNITY	FIPSCODE	LATITUDE	LONGITUDE
TX	HOUSTON	WESTFIELD	48201	30.0017	95.4000

Press RETURN key to continue ...

CENSUS DATA

AIRPORT HOLDING A
LATITUDE 29:59:20 LONGITUDE 95:22:34 1990 POPULATION

KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	SECTOR TOTALS
S 1	0	1534	0	19	11243	24431	37227
RING TOTALS	0	1534	0	19	11243	24431	37227

Press RETURN key to continue ...

STAR STATION

WBAN NUMBER	STATION NAME	LATITUDE	LONGITUDE	PERIOD OF RECORD	DISTANCE (km)
12960	HOUSTON/INTCONT TX	29.9833	95.3667	1981-1985	1.1
12918	HOUSTON/HOBBY TX	29.6500	95.2833	1964-1968	38.7
12906	HOUSTON/ELLINGTON TX	29.6167	95.1667	1966-1970	46.0
12923	GALVESTON/SCHOLES TX	29.2667	94.8667	1956-1960	94.1
12917	PRT ARTHUR/JEFFERSON CO TX	29.9500	94.0167	1981-1985	130.9
93987	LUFKIN/ANGELINA CO TX	31.2333	94.7500	1967-1971	150.7

```
12912  VICTORIA/FOSTER TX              28.8500     96.9167   1965-1974   195.5

Press RETURN key to continue ...CROSSTALK - XVI

                                    U.S.  SOIL  DATA
                                    ================

STATE : TEXAS

LATITUDE :  29:59:20    LONGITUDE :  95:22:34
THE STATION IS INSIDE H.U.    12040104


GROUND WATER ZONE                 :   10
RUNOFF SOIL TYPE                  :    1
EROSION                           :  1.1210E-03                         CM/MONTH
DEPTH TO GROUND WATER BETWEEN     :  3.0000E+03  AND  3.0000E+03
FIELD CAPACITY FOR TOP SOIL       :  6.0000E-02
EFFECTIVE POROSITY BETWEEN        :  2.0000E-02  AND  3.0000E-01
SEEPAGE TO GROUNDWATER BETWEEN    :  4.6330E+03  AND  1.3900E+04  CM/MONTH
DISTANCE TO DRINKING WELL         :  2.8000E+04                     CM

Press RETURN key to continue ...

[1;1f[J[1;1fMENU: Geodata Handling Data List procedures
[3;1f1.  Site level retrieval of data
(SITERET)[4;1f2.  Access Census Data
(CENSUS)[5;1f3.  Determine County Coverage
(COVERAGE)[6;1f4.  Geographic Data Management
 (GEODM)[7;1f5.  HUCODE/SOIL locator
(HUCODE)[8;1f6.  Convert to Lat/Long
(LATLON)[9;1f7.  Lookup/Examine Star Station Data
(STAR)[10;1f8.  Find US cities
(USCITY)[11;1f9.  Find Soil Survey Status of Counties
(SSURVEY)[12;1f10. 70, 80, 90, 95 Demographic Data Retrieval
 (SUPERPOP)[20;1fEnter an option number or a procedure name (in parentheses)
or a command: HELP, HELP option, BACK, CLEAR, EXIT, TUTOR
GEMS> [22;7f
```

REFERENCE 21 - Not Used

REFERENCE 22 - Not Used